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PB1589 Commercial Insect and Mite Control for Trees, Shrubs and Flowers

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Commercial Insect and Mite Control for Trees, Shrubs and Flowers

Frank A. Hale, Professor
Entomology and Plant Pathology

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Credit: This publication was adapted from "Insect and Mite Control on Woody Ornamentals and Herbaceous Perennials," Bulletin 504, an Ohio State University Extension publication authored by D.J. Shetlar, Department of Entomology, The Ohio State University, Columbus OH; "Insect Control for Shade Trees," EC 851, and "Insect Control for Shrubs," EC 780, authored by H.E. Williams, Professor Emeritus, Entomology and Plant Pathology, Agricultural Extension Service, The University of Tennessee.

Seasonal Appearance of Ornamental Pests and Normal Time Frame to Apply Control Measures

The following information serves as a guide to help you know the approximate time when control measures can be implemented. Consult the text for more detailed instructions and information:

Dormant - Before Growth Starts

Host	Pest
Arborvitae	tip dwarf mite, Fletcher scale, spruce spider mites
Ash	ash flower gall mite, scurfy scale, oystershell scale
Bittersweet	euonymus scale
Cotoneaster	San Jose scale
Douglas fir	Cooley spruce gall adelgid
Elm	European elm scale, Putnam scale, scurfy scale, San Jose scale
Euonymus	euonymus scale, winged euonymus scale
Fir	pine needle scale
Flowering fruit trees	mites, maple bladder gall mite, maple pouch gall mite, San Jose scale, scurfy scale, terrapin scale, aphids, white peach scale, pear psylla, European fruit lecanium scale
Hackberry	Putnam scale
Hawthorn	terrapin scale, European red mite
Hemlock	Hemlock scale, pine needle scale, Fiorinia scale
Hickory	Hickory leaf stem gall
Juniper	Juniper scale, tip dwarf mite, spider mites
Lilac	oystershell scale
Linden	cottony maple scale
Maple	terrapin scale, cottony maple scale, Putnam scale, oystershell scale, scurfy scale, lecanium scale, maple mealybug
Oak	golden oak scale, kermes scales, obscure oak scale, lecanium scale
Pine	pine bark adelgid, pine needle scale, eriophyid (rust) mites, white pine aphid
Poplar	oystershell scale
Spruce	spruce spider mite, spruce gall adelgid
Sweetgum	sweetgum pit-making scale
Tulip tree	tuliptree scale
Willow	oystershell scale
Yew (Taxus)	Fletcher scale, mealybugs

After Growth Starts

Late March-April (early)

Host	Pest
Ash	ash flower gall mite
Boxwood	boxwood psyllid
*Douglas fir	Cooley spruce gall adelgid
Pine	Pales weevil, Northern pine weevil, Zimmerman pine moth
Spruce	eastern spruce gall adelgid,
(Norway,	spruce spider mite,
red, black,	Cooley spruce gall adelgid,
white, Colorado)	spruce needle miner

*Cooley spruce gall adelgid of Douglas fir can be controlled from spring through fall when temperature is above 60 F.

April (early)

Host	Pest
Azalea	azalea lace bug
Boxwood	boxwood psyllid
Flowering fruit trees	eastern tent caterpillar
Honey locust	honey locust pod gall midge
Juniper	juniper webworm
Pine	white pine weevil, white pine aphid, European pine shoot moth,
	Nantucket pine tip moth
Spruce	northern pine weevil, Pales weevil, white pine weevil, spruce spider mite, spruce needle miner, gall adelgids

April (mid)

Host	Pest
Boxwood	boxwood psyllid
Fir	balsam twig aphid
Douglas fir	Cooley spruce gall adelgid
Flowering fruit trees	eastern tent caterpillar
Inkberry	inkberry leafminer
Magnolia	yellow poplar weevil
Maple	maple bladder gall mite
Pine	northern pine weevil, Pales weevil
Spruce (Colorado)	eriophyid mite, spruce spider mite
Tuliptree	yellow poplar weevil

April (late)

Host	Pest
Arborvitae	arborvitae leafminer
Ash	forest tent caterpillar
Birch	forest tent caterpillar
Boxwood	boxwood leafminer, boxwood psyllid
Elm	woolly apple aphid, elm leaf beetle
Euonymus	euonymus scale
Fir	balsam twig aphid
Flowering fruit trees	eastern tent caterpillar, lesser peachtree borer
Hackberry	hackberry nipple gall psyllid
Hawthorn	woolly apple aphid, hawthorn lace bug, hawthorn leafminer
Hemlock	spruce spider mite, hemlock scale, pine needle scale, fiorinia scale
Juniper	juniper webworm
Maple	eriophyid mite, maple shoot moths, forest tent caterpillar
Mountain ash	woolly aphid
Oak	forest tent caterpillar, gypsy moth
Pine	sawflies, spotted pine aphid, Nantucket pine tip moth, Zimmerman pine moth, pine tube moth, pine needle scale
Poplar	forest tent caterpillar
Spruce	balsam twig aphid, spruce spider mite, woolly larch aphid, pine needle scale
Sweetgum	forest tent caterpillar
Wild cherry	eastern tent caterpillar

May (early)

Host	Pest
Arborvitae	spruce spider mite, arborvitae leafminer
Ash	lilac (=ash) borer, forest tent caterpillar
Azalea	azalea mite, rhododendron borer, azalea lace bug
Birch	birch leafminer, forest tent caterpillar
Boxwood	boxwood leafminer
Dogwood	dogwood borer
Douglas fir	Cooley spruce gall adelgid
Elm	cankerworm
Flowering fruit trees	eastern tent caterpillar
Hackberry	lace bugs
Hawthorn	hawthorn leafminer, cankerworm
Holly	holly leafminer
Juniper	juniper midge, juniper tip midge, juniper scale
Laurel	rhododendron borer
Maple	forest tent caterpillar, fall cankerworm
Magnolia	magnolia borer
Mountain ash	lace bugs
Oak	lace bugs, oak kermes scale, golden oak scale, forest tent caterpillar
Pieris	andromeda lace bug

Pine	pine bark adelgid, spittlebug, eriophyid mite
Poplar	forest tent caterpillar
Rhododendron	rhododendron borer, lace bugs
Serviceberry	hawthorn lace bug
Shade trees	cankerworms Spruce spruce spider mite
Sweetgum	forest tent caterpillar
Sycamore	sycamore lace bug
Tuliptree	root collar borer
Yew (Taxus)	mealybugs

May (mid)

Host	Pest
Arborvitae	arborvitae leafminer, spruce spider mite
Ash	Putnam scale, oystershell scale
Birch	bronze birch borer, oystershell scale
Bittersweet	euonymus scale
Elm	flatheaded appletree borer, white-marked tussock moth
Euonymus	euonymus scale
Flowering fruit trees	flatheaded appletree borer, Putnam scale
Hackberry	Putnam scale
Hawthorn	hawthorn leafminer, scurfy scale, oystershell scale
Hemlock	Fiorinia scale
Hickory	hickory petiole gall adelgid
Juniper	juniper scale
Lilac	oystershell scale, lilac (=ash) borer
Linden	scurfy scale
Maple	oystershell scale, flatheaded apple-tree borer, green-striped maple worm
Mountain ash	lace bugs
Oak	flatheaded appletree borer, golden oak scale, oak kermes scale, May/June beetles, orange-striped oakworm
Pachysandra	euonymus scale, twospotted spider mite
Pieris	andromeda lace bug
Pine	spruce spider mite, eriophyid mite
Rhododendron	azalea leafminer, rhododendron borer
Serviceberry	hawthorn lace bug
Shade trees	white-marked tussock moth, scurfy scale
Sycamore	sycamore lace bug
Tuliptree	yellow poplar weevil
Willow	scale
Yew (Taxus)	mealybugs

May (late)

Host	Pest
Arborvitae	spruce spider mite,
Ash	oystershell scale, lilac (=ash) borer, fall webworm, elm spanworm
Azalea	lace bugs, rhododendron borer, azalea whitefly
Birch	bronze birch borer, oystershell scale Bittersweet euonymus scale
Boxwood	boxwood leafminer, lecanium scale
Dogwood	dogwood borer
Douglas-fir	bagworms
Euonymus	euonymus scale, winged euonymus scale
Flowering fruit trees	terrapin scale, (peach, plum, apricot)
Hawthorn	oystershell scale
Hemlock	spruce spider mite
Hickory	elm spanworm
Honeysuckle	honeysuckle leafminer
Juniper	juniper tip dwarf mite, juniper scale, spruce spider mite
Lilac	oystershell scale, lilac (=ash) borer
Magnolia	yellow poplar weevil
Maple	oystershell scale, green-striped maple worm
Mountain ash	European red mite, lace bugs
Mountain laurel	azalea leafminer, lace bug
Oak	golden oak scale, oak kermes scale, orange-striped oakworm, elm spanworm, an oak clearwing borer
Pachysandra	oystershell scale, euonymus scale
Pieris	andromeda lace bug
Pin oak	May beetles
Poplar	oystershell scale, euonymus scale
Rhododendron	azalea whitefly, azalea leafminer, rhododendron borer
Shade trees	terrapin scale, leafhoppers
Spruce	spruce spider mite
Tulip tree	yellow poplar weevil
Yew (Taxus)	mealybugs
Willow	oystershell scale

June (early)

Host	Pest
Arborvitae	arborvitae leafminer, bagworms, black vine weevil, Fletcher scale
Ash	elm spanworm
Azalea	azalea bark scale, black vine weevil
Birch	bronze birch borer
Flowering fruit trees	flatheaded appletree borer, woolly apple aphid
Hemlock	strawberry root weevil
Hickory	elm spanworm
Juniper	juniper tip midge, juniper scale

Linden	webworms
Maple	flatheaded appletree borer, lecanium scale
Oak	oak skeletonizers, May/June beetles, flatheaded appletree borer, lecanium scale, elm spanworm
Pine	European pine shoot moth, Nantucket pine tip moth
Rhododendron	azalea bark scale, black vine weevil
Spruce	spruce needle miner, spruce spider mite
Sweet gum	sweet gum pit-making scale
Sycamore	sycamore lace bug
Walnut	fall webworm
Yew (Taxus)	black vine weevil

June (mid)

Host	Pest
Arborvitae	arborvitae leafminer, bagworms, black vine weevil, Fletcher scale
Azalea	oystershell scale
Bald-cypress	bagworms
Birch	birch leafminer, bronze birch borer
Buckthorn	bagworms
Cedars	bagworms
Cotoneaster	San Jose scale, black vine weevil
Fir	bagworms, black vine weevil
Flowering fruit trees	San Jose scale, bagworms, peachtree borer
Hemlock	spruce spider mite, bagworms, black vine weevil
Hornbeam	bagworms
Ivy	Japanese beetle
Juniper	bagworms, juniper scale
Larch	bagworms
Linden	linden leaf beetles, Japanese beetle, bagworms
Maple	bagworms, lecanium scale
Oak	bagworms
Pine	pine tortoise scale, bagworms
Rhododendron	black vine weevil
Shade trees	bagworms, leafhoppers
Shrubs	Japanese beetle
Spruce	spruce spider mite, spruce needle miner
Walnut	walnut caterpillar
Willow	bagworm
Yew (Taxus)	Fletcher scale, black vine weevil

June (late)

Host	Pest
Arborvitae	bagworms
Euonymus	bagworms
Fir	bagworms
Flowering fruit trees	flatheaded appletree borer, San Jose scale, lesser peachtree

Hemlock	borer (peach, plum, apricot), bagworms
Honey locust	bagworms
Juniper	mimosa webworm
Linden	bagworms
Locust	bagworms
Maple	locust leafminer
Mimosa	flatheaded appletree borer, cottony maple scale, bagworms
Oak	mimosa webworm
Pine	flatheaded appletree borer, bagworms
Silver maple	bagworms, pine tortoise scale
Spruce	cottony maple scale, bagworms
Yew (Taxus)	spruce bud scale
	black vine weevil

July (early)

Host	Pest
Arborvitae	Fletcher scale, bagworms
Elm	elm leaf beetle
Euonymus	euonymus scale, bagworms
Flowering fruit trees	San Jose scale, bagworms
Hemlock	hemlock scale, pine needle scale, bagworms
Honey locust	mimosa webworm
Linden	cottony maple scale, bagworms
Oak	flatheaded appletree borer, bagworms
Pine	pine tube moth, pine webworm, bagworms
Silver maple	cottony maple scale, bagworms
Spruce	pine needle scale
Walnut	walnut caterpillar
Yew (Taxus)	black vine weevil, Fletcher scale

July (mid)

Host	Pest
Barberry	barberry webworms
Bittersweet	euonymus scale
Euonymus	euonymus scale, winged euonymus scale
Flowering fruit trees	San Jose scale
Honey locust	mimosa webworm
Maple	cottony maple scale
Oak	kermes scale, obscure scale, yellownecked caterpillar
Pine	pine tortoise scale, Pales, northern pine and white pine weevil adults
Yew (Taxus)	black vine weevil, mealybugs, Fletcher scale

July (late)

Host	Pest
Hemlock	hemlock looper
Honey locust	mimosa webworm
Juniper	juniper tip midge
Oak	oak skeletonizers, yellownecked caterpillar
Yew (Taxus)	black vine weevil

August (early)

Host	Pest
Honey locust	mimosa webworm
Mimosa	mimosa webworm
Pine	aphid, pine webworm

August (mid)

Host	Pest
Ash	banded ash clearwing

September (early)

Host	Pest
Arborvitae	Fletcher scale
Locust	locust borer
Magnolia	magnolia scale, magnolia borer
Maple	cottony maple scale
Pine	pine root collar weevil
Sweet gum	sweet gum pit-making scale
Tuliptree	tuliptree scale, root collar borer

September (mid)

Host	Pest
Juniper	juniper tip midge
Spruce	spruce gall adelgids

September (late through October)

Host	Pest
Juniper	juniper webworm
Pine	Pale weevil (adults)

Micro-Injection of Systemic Insecticides into Trees

Systemic insecticides, used as foliar sprays, soil drenches and granular applications to trees for control of a number of important pests, are not new.

Several companies have been developing various methods of injecting these same systemic insecticides directly into the trunks of trees to allow the vascular transport system to distribute the pesticide throughout the plant. Some of these injection systems use 3/8-inch to 1/2-inch holes for injecting or implanting capsules. Recent evidence indicates that these larger diameter holes may not heal rapidly on some species of trees. Therefore, these techniques should probably be avoided.

Other injection systems use much smaller injection holes, "micro-injection," which seem to heal more rapidly. The following two systems are nationally available:

Mauget System -

The J. J. Mauget Company, 5435 Peck Rd., Arcadia, CA 91006 provides a micro-injection system which uses prepacked plastic containers which can be compressed to provide internal pressure. An 11/64-inch drill bit is used to make holes in the tree trunk and a microinjector tube is inserted. The compressed container is then attached and the pesticide is injected into the tree vascular system. Mauget provides the following products:

IMICIDE (imidacloprid), IMISOL (imidacloprid plus DEBC), ABACIDE (abamectin) and ABASOL (abamectin plus DEBC) are labeled for use on ornamental trees and shrubs. INJECT-A-CIDE B (dicrotophos) is for use on trees listed on the label. IMICIDE and IMISOL have adelgids, aphids, beetles, borers, lace bugs, leafhoppers, mealybugs, pine tip moth, scale, thrips and whiteflies listed on the label. ABACIDE and ABASOL have bagworms, beetles, caterpillars, leafminers, mites and spittlebug listed on the label. INJECT-A-CIDE B has aphids, beetles, borers, caterpillars, galls, lace bugs, leafhoppers, leafminers, mites, pine beetles, pine tip moth, psyllids, scales and spittlebugs listed on the label.

Tree Tech Microinjection Systems, Inc.

Tree Tech Microinjection Systems, Inc., 950 215th Ave., Morriston, FL 32668 has developed a micro-injection system which uses prepacked plastic containers which can be compressed to provide internal pressure. A 11/64-inch drill bit is used to make holes in the tree trunk and a tip with container is inserted. A tap with a mallet seats the tip and compresses the container.

Vivid II (abamectin) is labeled for use on ornamental trees (including forest, non-cropbearing as well as woody shrubs) for control of adelgids, aphids, browntail moth, elm leaf beetle, lace bug, lygus bug, mites, oakworm, scale, white pine weevil, engraver beetle, eucalyptus borer and flatheaded borer.

Dendrex (acephate) is labelled for use on flowering crabapple for control of aphids, tent caterpillars and leafrollers. It is labeled for other trees and shrubs for control of aphids, bagworms, birch leafminer, tent caterpillars, lace bugs, tussock moth larvae, Gypsy moth larvae, scale crawlers, grasshoppers, cankerworms (spring and fall), Nantucket pine tip

moth, Zimmerman pine moths, root weevil adults, boxelder bugs, thrips, whiteflies, bronze birch borer, Japanese beetles, elm leaf beetle (larvae), and other listed pests.

Harpoon (oxydemeton-methyl) is labeled for the following trees and pests: cedars (bark beetle), cottonwoods (aphids), Douglas-fir (cone moths, engraver beetles), elms (elm leaf beetles), junipers (bark beetles), pines [except pinyon] (6-spined engraver beetles, flatheaded borer, black turpentine beetle, Nantucket pine tip moth, pine needle scale and a few other listed pests), redwood (bark beetles, mites and needle scale), spruce (adelgids) and walnuts and pecans [non-bearing] (aphids, mites).

Insect & Mite Control Recommendations for Trees & Shrubs

Use Pesticides Properly to Prevent Pollution

The proper use of pesticides will reduce the pollution of our environment to the necessary minimum. Pesticides are carried into water on soil particles that erode. Take measures necessary to prevent erosion. Do not pour excess spray mixtures or pesticides into the sewage systems. Every little bit disposed of in this way adds to the stream pollution problem. Wash the residues from your empty container and mix it into your garden spray. Apply the last drop of the pesticide to your plants. Triple or pressure rinse container, puncture or crush and put in a sanitary landfill. Observe wind conditions and avoid spraying during periods of windy weather to prevent drifts.

Anticipate Pest Problems

Every ornamental plant is host to a variety of insect pests during the growing season. Anticipate insect problems and inspect the leaves, stems, buds and flowers of ornamentals regularly. Frequently, the problem can be identified by observing the injury which results from the feeding activities of the insect. Damage from a heavy infestation can be prevented by early detection and control.

Emergence of Insects

Insects will begin to feed and deposit eggs when the temperatures rise to 50 to 65 F or above and remain in this range for one to two weeks. In some years, pests may appear one to two weeks earlier or later than in other years because of an early or late spring.

Effective Spraying

Insecticides are most effective when they are applied to the parts of the plant on which the young larvae or nymphs are feeding. A fine-mist spray will thoroughly wet the plant surfaces. Stop spraying when the plant surfaces are wet to the point of run-off or dripping. Repeat the spray applications at regular intervals to control the late-hatching, emerging or migrating insects.

Apply an insecticide when weather conditions are favorable. The temperatures should be in the 60 to 80 F range with a wind velocity of less than five miles per hour, with no rain forecast for 24 hours. If one-half inch or more of rainfall occurs within 12 hours after spraying, repeat the application.

Table 1. Ornamental Pests

Revised 3/12

Host & Pest	Stage	Where to Treat	What to Use	When to Treat
ARBORVITAE				
Aphids	E	Crevices of bark on twigs of most deciduous plants	dormant oil	February-March
	N & A	Undersides of leaves of elm, linden, maple, oak and many other plants; also twigs; also needles of some conifers.	Malathion, Diazinon, Dursban, Dimethoate, Merit, Talstar, Orthene, Discus, insecticidal soap, Marathon Endeavor, Flagship, Safari, TriStar	April-September
Bagworm	L	Foliage of many trees, shrubs, hedges, especially arborvitae, white cedar	Sevin, Carbaryl, Bt (Dipel, Javelin & others), Malathion, Diazinon, Orthene, Dursban, Dylox, Talstar, Mavrik, Onyx, Aquaflow, Tempo, Decathlon, Tempo SC Ultra, Conserve SC, SpinTor, Scimitar, Mimic, Onyx, Onyx Pro, Acelepryn	late May-July
Arborvitae Leaf Miner	A	All foliage of arborvitae	Dursban, Orthene, Discus, Dimethoate, Merit, Marathon	May-June
Fletcher Scale	N	Foliage and twigs of Taxus and arborvitae	horticultural oil	April
	C		Merit, Diazinon, Malathion, horticultural oil, Dimethoate, Orthene, Discus, Dursban, Tempo, Decathlon, Tempo SC Ultra, Marathon, Flagship, Safari, Allectus SC, Arena, Talus	May-June
Spruce Mite	E	Foliage, especially inner foliage	dormant oil	February-March
	N		Hexygon, Avid, horticultural oil, insecticidal soap, MSR Spray Concentrate, Floramite, TetraSan, Judo, Forbid, Shuttle	April-June, September-October
	A			Two sprays made one week apart. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
ASH				

Table 1. Ornamental Pests

Revised 3/12

Host & Pest	Stage	Where to Treat	What to Use	When to Treat
Lilac Borer/Ash Borer and Banded Ash Clearwing	L A	Bore into branches and trunk, scar wounds. Sawdust (boring dust) protruding from boring holes.	Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	Mid-April and mid-July for ash. Prune and burn dead and dying branches. Remove larvae with sharp knife. Insert wire into boring hole. Entomopathogenic nematodes can be applied to the trunk from May to September to control borers in an infested tree or shrub. Dursban or permethrin can be used 2 weeks after using entomopathogenic nematodes.
Ash flowergall mite (Eriophyid mite)	E N A	Twigs Foliage and blossoms	dormant oil horticultural oil, Sevin, Carbaryl, Judo, Forbid, Avid	February-March Treat when first blossoms begin to form.
Plant/leaf bugs	N A	Foliage	Sevin, Carbaryl, Dursban, Malathion, Mavrik Aquaflo, Scimitar, Talstar, Tempo, Decathlon, Flagship, Meridian, Allectus SC, Arena	Treat when young nymphs appear in early spring and repeat as needed.

AZALEA

Aphids	N & A	Undersides of leaves and stems	Merit, Malathion, Diazinon, Orthene, Discus, Talstar, insecticidal soap, Pyrellin, Marathon, Flagship, TriStar, Safari, Meridian, Allectus SC, Arena	April-October
Azalea Caterpillar	L	Foliage	Decathlon, Sevin, Carbaryl, Conserve SC, Tempo, Talstar, Scimitar, Onyx, Onyx Pro, DeltaGard, Acelepryn	June-September
Azalea Bark Scale	N	Bark of twigs and branches of azalea, rhododendron, Andromeda	Diazinon, Sevin, Carbaryl, Malathion, Orthene, Merit, Marathon, Safari, Talus	May-June
Lace Bug	N A	Undersides of leaves	Drench with Safari, Merit or Marathon or use granular Arena as an alternative to foliar sprays. Dimethoate, Orthene, Discus, Tempo, Diazinon, Allectus SC, Decathlon, Merit, Tempo SC Ultra, Marathon, Flagship, Dursban 50W, Safari, Arena, Acelepryn	February-March April-October
Azalea Leaf Miner	L	Foliage, larvae within rolled leaves of azalea	Merit, Dimethoate, Diazinon, Malathion, Sevin, Carbaryl, Azatin, Orthene, Address, Talstar, Dursban 50W, Marathon	May-August

Table 1. Ornamental Pests

Revised 3/12

Host & Pest	Stage	Where to Treat	What to Use	When to Treat
Azalea Leaf Tier	L	Foliage of azalea (see also fruittree leaf roller)	Sevin, Carbaryl, Talstar, Azatin, Orthene, Acelepryn	May-June
Azalea Stem Borer	A	Tips of twigs, trunk	prune and burn dead and dying twigs	May, June
	L	Circles stems, bores in stems and trunk	Dursban, Orthene	
Azalea Whitefly	N & A	Undersides of leaves of azalea, rhododendron, andromeda	Dimethoate, Malathion, Diazinon, Dursban 50W, Allectus SC, Orthene, Discus, Talstar, Azatin, Marathon, Meridian, Merit, Flagship, TriStar, Safari, Arena, Talus	May-August
Black Vine Weevil	A	Foliage, bark or trunk and branches, and the surfaces of ground beneath where beetles walk after emerging	Tempo, Decathlon, Tempo SC Ultra, Diazinon, Meridian, Orthene, Dursban, Talstar, Mavrik Aquaflo, Merit, Marathon, entomopathogenic nematodes	May-September Treat three weeks until no adults are found. If adults can overwinter in container plants in polyhouses begin treatments in March-April.
	L	Roots		May-September
Two-banded Japanese Weevil	L & A	Foliage, roots. Adults notch leaves eventually leaving only the petiole.	Talstar, Orthene	April-September
Southern Red Mite	E, N & A	Underside of leaves	Hexygon, insecticidal soap, Floramite, TetraSan Judo, Forbid, Avid, horticultural oil	May-October Two sprays made one week apart. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
BARBERRY				
Aphids	All	Undersides of leaves, stems, on new shrubs	Merit, Diazinon, Malathion, Orthene, Discus, Dursban, Talstar, Endeavor, Allectus SC, Marathon, Flagship, TriStar,	April-August

Table 1. Ornamental Pests

Revised 3/12

Host & Pest	Stage	Where to Treat	What to Use	When to Treat
			Safari, Meridian, Arena	
Barberry Looper	L	Thorough coverage of foliage	Orthene, Talstar, Tempo, Mavrik Aquaflow, Decathlon, Tempo SC Ultra, Scimitar, Acelepryn	May-July
Webworm	L	Twigs and leaves webbed together	Sevin, Malathion, Dylox, Orthene, Tempo, Decathlon, Talstar, Mavrik Aquaflow, Scimitar, Acelepryn	July-September
Whitefly	E, N & A	Undersides of leaves	Diazinon, Malathion, Dursban, Allectus SC, Azatin, Merit, Meridian, Arena, Marathon, Flagship, TriStar, Safari, Talus	April-September
BIRCH				
Bronze Birch Borer (flatheaded borer)	A L	Treat entire tree especially the upper part of tree and the unshaded areas of trunk with wounds or cracks in the bark. Tunnels under bark and in sapwood. Stressed trees are very susceptible.	Merit, Marathon or Discuss drench around the base of the tree as an alternative to trunk sprays. Fertilize to maintain vigor. Protect trunk from physical injury and sun scald. Dursban, Onyx, Onyx Pro, Perm-Up, permethrin (Astro, and others)	February to mid-April Late May, early July
Yellownecked caterpillar	L	Foliage of birch and other hardwoods such as oak, maple, hickory, crabapple, quince, elm, butternut, walnut and locust.	Sevin, Carbaryl, Bt (Dipel, Javelin and others), Dursban, Conserve SC, SpinTor, Talstar, Onyx, Onyx Pro, Scimitar, DeltaGard, permethrin, Decathlon, Tempo, Acelepryn	July-August

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Birch Leafminer	L E A	Large, blotched, or blistered areas on leaves. New leaf growth attacked generally in early season.	MSR Spray Concentrate, Sevin, Carbaryl, Talstar, Malathion, Orthene, Dimethoate, Merit, Marathon, Acelepryn	May-August Apply Merit to the soil (not mulch) in February-March as a soil drench or a soil injection
Aphids	E	branches	dormant oil	February-March
Spiny Witch-hazel Leaf Gall Aphid	hibernating female N	foliage	dormant oil (Systemic drenches of Merit, Marathon, Discuss, Flagship and Safari can be made during February-March instead of an April-May spray) Orthene, Dimethoate, Discus, Merit, Marathon, Flagship, Safari, Meridian, Allectus SC	February-March April-May
Dusky Birch Sawfly	L	foliage	Tempo, Decathlon, Tempo SC Ultra, Scimitar, Talstar, Dursban, Orthene, Merit, Marathon, Discus, Allectus SC	April-May June-August
BOXELDER				
Boxelder Bug	N A	Leaves, stems, trunk, seeds. Male trees do not produce seed on which bugs feed. The false boxelder bug or red shoulder bug is similarly associated with the goldenraintree.	Tempo, Decathlon, Tempo SC Ultra, Sevin, Carbaryl, Malathion, Diazinon, Dursban, Talstar	May-September
BOXWOOD				
European Hornet	A	Bark of twigs, especially lilac, also ash, rhododendron, birch (locate and spray nest)	Sevin, Dursban	June-July
Boxwood Leafminer	A L L	Thorough coverage of foliage of boxwood. Soil drench as an alternative to a foliar spray in April-May. Underside of leaves of boxwood	Sevin, Carbaryl, Dimethoate Allectus SC, Merit, Marathon, Discus, Safari Dimethoate, Orthene, Discus, Merit, Marathon, TriStar	April February-early April for Merit, Marathon or Allectus SC Late March-Early April for Safari April-May

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Mealybugs	All	Stems and leaves	Malathion, Dimethoate, Orthene, Discus, Dursban, Talstar, Merit, Marathon, Flagship, TriStar, Safari, Meridian, Allectus SC, Arena, Talus	April-September
Boxwood Mite	E L N A	Underside of leaves of boxwood	dormant oil Orthene, Forbid, Judo, Avid, TetraSan	February-March Late April-June Two sprays made one week apart.
Boxwood Psyllid	A	Underside of leaves of boxwood	Malathion, Dursban, Dimethoate, Talstar, Orthene, Discus, Tempo, Decathlon, Tempo SC Ultra, Merit, Marathon	Late March-May
Webworms	L	Leaves webbed together, turn brown	Sevin, Dylox, Orthene, Dursban, Acelepryn, Conserve SC, SpinTor, Talstar, Onyx, Onyx Pro, Scimitar, DeltaGard, permethrin (Astro, and others), Decathlon, Tempo	May-September

CATALPA

Catalpa Sphinx	L	Leaves of tree, defoliate tree.	Dursban, Sevin, Carbaryl, Orthene, Acelepryn, Bt (Dipel, Javelin & others), Talstar, Onyx, Onyx Pro, Decathlon, Tempo, DeltaGard, permethrin (Astro, Perm-Up and others), Scimitar	May, July
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CHESTNUT

Large Chestnut Weevil, Small Chestnut Weevil	E L A P	Nuts, leaves and burrs, soil.	Sevin	Apply four sprays on a 7-10 day interval beginning August 7. Gather nuts daily so that emerging weevil larvae cannot enter the soil.
Giant Bark Aphid (Hickory Aphid)	E N A	Bark of trunk and limbs. Several generations. Large population causes severe damage.	insecticidal soap, Merit, Malathion, Diazinon, Orthene, Discus, Arena, Allectus SC, horticultural oil, Meridian, Marathon, Endeavor, Flagship, TriStar, Safari	April, May, June, July, August

Table 1. Ornamental Pests

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Fall Webworm	E L	Web encloses leaves and twigs on terminal end of branches.	Bt (Dipel, Javelin, and others), Orthene, Dursban, Diazinon, Malathion, Sevin, Carbaryl, SpinTor, Conserve SC, Mimic, Scimitar, DeltaGard, Talstar, Onyx, Onyx Pro, Decathlon, Tempo, Acelepryn, permethrin (Astro, Perm-Up and others)	May-June, August-September
Twig Pruner	L E	Bore under bark and in center of twigs. Cut twig off by making concentric circular cuts from center of twig outward.	Chemical control is not practical	Collect and burn fallen twigs.
Granulate Ambrosia Beetle (formerly called Asian Ambrosia Beetle)	A	Trunk and branches. Treat at first sign of attack, usually when tree is just about to come out of winter dormancy. Look for tiny shotholes in tree with toothpick diameter protrusions composed of sawdust-like frass.	permethrin (Astro, Perm-Up and others), Dursban (use ambrosia beetle rate), Onyx, Onyx Pro	Late March-May or when attack seen.
DOGWOOD				
Dogwood Borer	L	Trunk and lower limbs from soil line to lower limb scaffold.	Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	Late-April and mid-July. Entomopathogenic nematodes can be applied to the trunk from May to September to control borers in an infested tree or shrub. Dursban or permethrin can be used 2 weeks after using entomopathogenic nematodes.
Dogwood Club Gall (Midge)	A L	Leaves and small branches.	Sevin, Carbaryl	Treat when leaves are expanding in early spring.

Table 1. Ornamental Pests

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Dogwood Twig Borer	L	Tunnels in limbs, holes and boring dust along underside of infested wilting limb. Prune and burn infested limbs in May or June before borer matures.	Dursban, permethrin (Astro, Perm-Up and others)	Mid-June
Rose Leafhopper	N A	Foliage commonly stippled white.	Sevin, Carbaryl, Malathion, Flagship, Discus, Marathon, Merit, TriStar, Meridian, Allectus SC, DeltaGard, Safari, Talus	April-August
Whitefringed Beetle	A	Larvae girdle trunk and roots below soil line, especially on seedlings.	Sevin, Carbaryl, Imidan Mow and rake before spraying.	June-September Spray the plants and all of the ground on a 10 day schedule to control the adults and prevent egg laying. Keep infested fields free of weeds. Do not use leguminous cover crops such as red clover. Instead, use oats, sudex or small grains. Do not plant dogwood near kobus magnolia or yellowwood.
Japanese Beetle White Grubs	L	Larvae feed on fibrous roots. This is primarily a regulatory problem when shipping nursery stock to states west of the Mississippi river. Check with the TN Dept. of Agriculture for current shipping certification of ball and burlap nursery stock.	Merit, Marathon	June-July
Dogwood Sawfly	L	Foliage	Malathion, Diazion, Dursban, Orthene, Sevin, Carbaryl, Scimitar, Talstar, Tempo, Decathlon, Tempo SC Ultra, SpinTor, Conserve SC, Merit, Marathon, Discus, Allectus SC	July-August
Flatheaded Appletree Borer	all	Larvae bore into trunk and feed in phloem and on the sapwood. Newly transplanted trees are very susceptible	Marathon, Discus, or Merit, drench around the base of the tree as an alternative to trunk sprays. Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	February to mid-April Early May – mid-June

Table 1. Ornamental Pests

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Granulate Ambrosia Beetle (formerly called Asian Ambrosia Beetle)	A	Trunk and branches. Treat at first sign of attack, usually when tree is just about to come out of winter dormancy. Look for tiny shotholes in tree with toothpick diameter protrusions composed of sawdust-like frass.	permethrin (Astro, Perm-Up and others), Dursban (use ambrosia beetle rate), Onyx, Onyx Pro	Late March-May or when attack is seen.
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ELM

Elm Coxcomb Gall	E N A	Leaves, series of elevations with red tips filled with green or brown aphids. Resembles a rooster's comb.	Malathion, Diazinon	March, April, May
Elm Leaf Aphid	E N A	Leaves, small yellow to green aphids.	Marathon, Meridian, Arena, insecticidal soap, Diazinon, horticultural oil, Safari, Allectus SC, Malathion, Dursban, Merit, Endeavor, Flagship, TriStar	April, May-June
Elm Sack Gall	E N A	Leaves, bladder-like galls attended by ants.	Diazinon, Malathion	March, April-May
Elm Bark Beetle (Native Elm Bark Beetle)	E L A	Bark of small branches and trunk carry Dutch Elm disease.	Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	May
European Elm Bark Beetle	E L A	Principal vector of Dutch Elm disease. Crotches of small twigs in outer perimeter of crown.	Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	February, May
European Elm Scale (Brown Elm Scale)	E C N A	The overwintering nymphs adhere to the twigs and base of buds. Crawlers hatch in late May to mid-June and move to the leaves where they develop for the rest of the summer.	dormant oil horticultural oil, Diazinon, Malathion, Tempo, Decathlon, Tempo SC Ultra, Sevin, Carbaryl, Dursban, Discus, Merit, Marathon, TriStar, Distance, Allectus SC	February-March June-August

Table 1. Ornamental Pests

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White-Banded Leafhopper	E N A	Vector of phloem necrosis. Bark, leaves.	Sevin, Carbaryl, Diazinon, DeltaGard, Dursban, Merit, Discus, Marathon, Flagship, TriStar, Arena, Safari, Talus	May, June
Elm Leaf Beetle	E L P A	Leaves skeletonized, turn brown.	Sevin, Carbaryl, Dursban, Conserve SC, Merit, Marathon, Discus, Allectus SC	April, May, July
Larger Elm Leaf Beetle	E L P A	Large yellow to brown beetle with greenish patches at end of wing covers (elytra). Larvae are reddish-brown, metallic lustered.	Sevin, Malathion, Conserve SC, Merit, Marathon, Discus, Allectus SC	May, June
Elm Leafminer	L	Foliage of elm.	Dursban, Discus, Merit, Marathon, Talstar	May-June
Whitefringed Beetle	A	Larvae girdle trunk and roots below soil line, especially on seedlings.	Sevin, Carbaryl, Imidan Mow and rake before spraying.	June-September Spray plants and surface of soil on a 10 day schedule to control the adults and prevent egg laying. Keep infested fields free of weeds. Do not use leguminous cover crops such as red clover. Instead, use oats, sudex or small grains. Do not plant elm near kobus magnolia or yellowwood.

EUONYMUS

Bean Aphid	All	Undersides of leaves and stems	Merit, Marathon, Malathion, Diazinon, Allectus Sc, Orthene, Discus, insecticidal soap, horticultural oil, Endeavor, Flagship, TriStar, Safari, Meridian, Arena	April-September
Euonymus Scale	E, A C,N	Foliage, twigs and stems of euonymus bittersweet, pachysandra	dormant oil horticultural oil, Malathion, Sevin, Carbaryl, Orthene, Dursban, insecticidal soap, Dimethoate, Safari, TriStar, Distance, Talus	February-March April-August. Two sprays 10 days apart whenever crawlers are emerging. Two more sprays at 10 day intervals will be needed for each flush of crawlers (Dimethoate, Safari only one application needed).

Table 1. Ornamental Pests

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WINGED EUONYMUS (BURNING BUSH)				
Twospotted Spider Mite	ELNA	Foliage	horticultural oil, Hexygon, insecticidal soap, Avid, Floramite, Isotox IV, Ovation SC, TetraSan, Judo, Forbid, Shuttle	April-August Two to three sprays made 5 days apart. Do not use horticultural oil more than once per week. Hexygon should only be used once per crop cycle or once per year; since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
Indian Wax Scale	A		dormant oil	February-March
	CN		Merit, Marathon, Discus, Dursban, Orthene, Dimethoate, Flagship, Talus, Safari, TriStar, Distance, Allectus SC	Applications of systemic insecticide should be made in late April to the soil. Wait until mid-May to make foliar applications of other listed insecticides. A second foliar application should be made 10-14 days after the first application. Since there are 2-3 generations per year, spray again with the two spray regiment whenever crawlers are seen emerging.
FRUIT TREE FLOWERING ORNAMENTAL (Ornamental Crabapple, Cherry, Plum, Pear; fruit not for consumption)				
Aphids (crabapple, pear, plum, cherry)	ENA	Leaves, twigs, buds, discoloration, distortion, honeydew.	insecticidal soap, horticultural oil, Meridian, Arena, Malathion, Diazinon, Orthene, Discus, Merit, Marathon, Endeavor, Flagship, TriStar, Safari, Allectus SC	April, May, June, July, August Note: Do not use Orthene or Isotox IV on flowering crab apple as foliar injury may occur.
Green Peach Aphid (Plum, cherry)	ENA	Slender, light green or yellow. Treat foliage.	insecticidal soap, Meridian, Arena, Malathion, Discus, Allectus SC, Merit, Marathon, Diazinon, Orthene, Safari, Endeavor, horticultural oil, Flagship, TriStar	April, May, June
Apple Aphid (crabapple)	ENA	Treat foliage. This aphid is green.	insecticidal soap, Meridian, Arena, Malathion, Allectus SC, Diazinon, Discus, Merit, Marathon, Endeavor, horticultural oil, Flagship, TriStar, Safari	March, April, May

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The Rosy Apple Aphid (crabapple)	E N A	Dark purple, rosy pink, or slate. Treat foliage.	Talstar, Discus, Allectus SC, Arena, Merit, Marathon, insecticidal soap, horticultural oil, Diazinon, Malathion, Endeavor, Flagship, TriStar, Safari, Meridian	March, April, May
Woolly Apple Aphid (crabapple, elm, mountain ash)	E N A	Leaves, twigs, buds, roots, blue-black with white, wooly covering over rear end of body. Treat balled and burlapped and container grown plants.	horticultural oil, Diazinon, Di-Syston, Malathion, Mavrik Aquaflo, MSR Spray Concentrate, Discus, Merit, Marathon, Allectus SC, Dursban, Talstar, Endeavor, Meridian, Flagship, TriStar, Safari	April, May, June, July, August
Peachtree Borer (cherry, plum, peach)	E L A	Roots, trunk and lower limb scaffold.	Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	Late May, July 15 Entomopathogenic nematodes can be applied to the trunk from late June to September to control borers in an infested tree or shrub. Dursban or Lindane can be used 2 weeks after using entomopathogenic nematodes.
Shothole borer	A	Trunk and limbs	Dursban, permethrin (Astro, Perm-Up and others)	Later May, July 15 Same timing of sprays as with peachtree borer.
Lesser Peachtree Borer (cherry, plum, peach)	E L A	Injured areas of trunk limbs.	Dursban, Onyx, permethrin (Astro, Perm-Up and others)	Late April, Mid-June Entomopathogenic nematodes can be applied to the trunk from late May-September to control borers in an infested tree or shrub. Dursban or Lindane can be used 2 weeks after using entomopathogenic nematodes.
Round-headed Appletree Borer (crabapple, mountain ash, hawthorn, serviceberry, chokecherry, quince, cotoneaster)	E L A	Trunk near ground. Young seedling trees frequently damaged.	Dursban, permethrin (Astro, Perm-Up and others)	April, June
Flatheaded Appletree Borer	All	A pest of crabapple.	Marathon, Discus, or Merit drench around the base of the tree as an alternative to trunk sprays. Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	February to mid-April Early-May, mid-June

Table 1. Ornamental Pests

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Fall Webworm (crabapple, cherry, pear, plum)	L	Tents over terminal end of branches.	Dursban, Orthene, permethrin (Astro, Perm-Up and others), Sevin, Carbaryl, Malathion, Bt (Dipel, Javelin and others), Tempo, Decathlon, Tempo SC Ultra, Talstar, Scimitar, Diazinon, Conserve SC, SpinTor, Mimic, Acelepryn	June, August Note: Do not use Orthene or Isotox IV on flowering crab apple as foliar injury may occur.
White Apple Leafhopper (crabapple)	N A	Leaves are stripped and blotched by feeding of leafhoppers	Discus, Merit, Marathon, Sevin, Carbaryl, Allectus SC, DeltaGard GC, permethrin (Astro, Perm-Up and others), Flagship, TriStar, Meridian, Arena, Safari, Talus	April, May, June, July, August, September
Rose Leafhopper (crabapple)	N A	Leaves are stippled and blotched by feeding of leafhoppers.	Sevin, Carbaryl, Allectus SC, , Discus, Merit, Marathon, permethrin (Astro, Perm- Up and others), Flagship, TriStar, Meridian, DeltaGard GC, Arena, Safari, Talus	April, May, August, September
Mites -- European red mite, Twospotted spider mite, (crabapple, pear, cherry, plum)	E L N A	Limbs, crevices of bark on limbs and trunk. Foliage	dormant oil (not for twospotted spider mites) Hexygon, horticultural oil, Avid, insecticidal soap, Floramite, Isotox IV, Ovation SC, TetraSan, Judo, Forbid, Shuttle (for twospotted spider mites)	February-March April-September Two to three sprays made 5 days apart. Do not use horticultural oil more than once per week. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
Pear Slug (pear)	E L A	Leaves are skeletonized by feeding larvae.	Diazinon, Carbaryl, Sevin, Marathon, Conserve SC, SpinTor, Allectus SC, Discus, Merit,	April-May, July
Pear Psylla (pear)	E N A	Crevices of bark on trunk, debris or ground cover. They feed on buds and leaves, causing leaf drop and deformed buds.	dormant oil Diazinon, Allectus SC Azatin XL, Ornazin	February-March Spray foliage two weeks after petal fall and again two weeks later.

Table 1. Ornamental Pests

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San Jose Scale (crabapple, pear, cherry, plum)	E C N A	Circular, size of a pinhead, dark brown to black, raised dull yellow center, males oval. Lemon yellow crawlers on stems, buds, leaves and fruit.	dormant oil horticultural oil, Diazinon, Sevin, Carbaryl, Malathion, Orthene, TriStar, Talus Dursban, Safari, Distance	February-March May, June-July, August Note: Do not use Orthene or Isotox IV on flowering crab apple as foliar injury may occur.
Oystershell Scale (crabapple, pear, cherry, plum)	E C N A	Brown to gray, oyster shell shape, 1/8 inch long, narrow at one end, widened and rounded at other end. Males are smaller and oval.	dormant oil horticultural oil, Diazinon, Sevin, Carbaryl, Malathion, Orthene, Tempo, Decathlon, Tempo SC Ultra, Safari, Tri-Star, Distance	February-March May-June, July-August Note: Do not use Orthene or Isotox IV on flowering crabapple as foliar injury may occur.
Granulate Ambrosia Beetle (formerly called Asian Ambrosia Beetle)	A	Trunk and branches. Treat at first sign of attack, usually when tree is just about to come out of winter dormancy. Look for tiny shotholes in tree with toothpick diameter protrusions composed of sawdust-like frass.	permethrin (Astro, Perm-Up and others), Dursban (use ambrosia beetle rate), Onyx, Onyx Pro	Late March-May or when attack is seen.
Terrapin Scale (crabapple, pear, plum, cherry)	E C N A	One of largest native scales, dark brown, hemispherical, convex, crimped or fluted around edges. Crawlers flattened, lighter in color, leaves, twigs.	dormant oil horticultural oil, Malathion, Diazinon, Sevin, Carbaryl, Orthene, Discus, Allectus SC, Merit, Marathon, Flagship, Safari, TriStar, Distance, Arena, Talus	February-March May-June Note: Do not use Orthene or Isotox IV on flowering crabapple as foliar injury may occur.
European Fruit Lecanium Scale (crabapple, pear, plum, cherry)	E C N A	Larger but similar in appearance to Terrapin scale. May be partly covered with white powdery substance.	dormant oil horticultural oil, Diazinon, Malathion, Sevin, Carbaryl, Merit, Orthene, Discus, Allectus SC, Marathon, Flagship, Safari, Arena, Talus	February-March June-August Note: Do not use Orthene or Isotox IV on flowering crabapple as foliar injury may occur.
Japanese Beetle	A	The beetles are 3/8 inch long, metallic green with coppery wing covers	Merit, Marathon, Discus, Sevin, Tempo, Decathlon, Tempo SC Ultra, Talstar, Scimitar	April (soil application) June, July & early August (spray weekly)

Table 1. Ornamental Pests

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White Peach Scale (plum, cherry, peach)	E C N A	Circular, white tinged with brown.	dormant oil horticultural oil, Malathion, Diazinon, Orthene, Dursban, Safari, TriStar, Distance, Talus	February-March May, July, September Three generations - treat when crawlers are present. Note: Do not use Orthene or Isotox IV on flowering crabapple as foliar injury may occur.
Fall Cankerworm (crabapple)	E L A	Adults emerge to lay eggs in November and December. Larvae appear as foliage develops in the spring. Slender, green, striped, looping caterpillars.	dormant oil Sevin, Carbaryl, Bt (Dipel, Javelin, and others), Conserve SC, SpinTor, Scimitar, Talstar, Mimic, Acelepryn Trap the emerging adult females crawling up the trunk to lay eggs with a sticky adhesive band of tangle foot.	February-March April
Eastern Tent Caterpillar (crabapple, cherry, peach)	L	Dirty white webs in limb crotches beginning in March when wild cherry leaves are developing. Larvae remain in web during cloudy or rainy weather, defoliate trees.	horticultural oil, Tempo, Decathlon, Tempo SC Ultra, Talstar, Sevin, Carbaryl, Bt (Dipel, Javelin, and others), Scimitar, Acelepryn, Dursban, Orthene, Malathion, Diazinon, Conserve SC, insecticidal soap, SpinTor, Mimic	March-April Note: Do not use Orthene or Isotox IV on flowering crabapple as foliar injury may occur.
Oriental Fruit Moth (crabapple, cherry, pear and plum)	L P A	Pinkish white 1/2- inch larva tunnel in succulent shoot tip.	Dursban, Acelepryn, permethrin (Astro, Perm-Up and others), Talstar, DeltaGard, Scimitar, Onyx, Onyx Pro	April, July, August

HACKBERRY

Psyllids (hackberry Nipple Gall)	E N A	Nipple-shape gall on underside of leaf. Cup-shaped impression on upper side of leaf.	Discus, Malathion, Merit, Marathon, Sevin, Carbaryl, Dursban, Allectus SC	Treat when leaf buds are showing some green and again when leaves are one-half expanded.
Psyllids (Blister Gall)	E N A	Blister gall on leaf, circular, flat and blister-like. Convex on underside with a nipple in the center.	Malathion, Dursban, Sevin, Carbaryl, Merit, Marathon, Discus, Allectus SC, MSR Spray Concentrate (soil injection)	Treat when leaf buds are showing some green and again when leaves are one-half expanded.

Table 1. Ornamental Pests

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Asian Woolly Hackberry Aphid	E	Twigs of hackberry and sugarberry	dormant oil	February-March
	N	root zone	Drench with Merit, Discuss, Marathon, Flagship, Allectus SC, Meridian	March-June
	A	foliage	Marathon II, Flagship, Tristar, Safari, Meridian, Allectus SC, Arena	July-September
HEMLOCK				
Spruce Mite	E	Needles turn yellow, webbing between leaves.	dormant oil	February-March
	N		Hexygon, Avid, MSR Spray Concentrate, insecticidal soap, horticultural oil, Floramite, TetraSan, Judo, Forbid, Shuttle	April, September-October
	A			Two sprays made one week apart. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide
Hemlock Eriophyid Mite (Rust Mites)	E	Needles with grayish cast, feed on upper and lower needle surfaces.	dormant oil	February-March
	N		horticultural oil, Sevin, Carbaryl, Avid, Dimethoate, Judo, Forbid	April-May
	A			Two sprays made one week apart.
Hemlock Looper	L	Foliage.	Sevin, Carbaryl, SpinTor, Conserve SC, Mimic, Acelepryn, Talstar, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others), Tempo, DeltaGard, Scimitar, Decathlon	May, June
Elongate Hemlock Scale	A C	Foliage. Crawlers are yellow while the adult female is 1.5 mm long, elongate with a light yellow brown to brownish orange waxy cover. The smaller males have a white waxy cover in the nymphal stages.	horticultural oil, Safari, TriStar, Distance, Talus	May, June, July Note that Safari 20SG can be used on ornamental hemlock in landscapes and nurseries. Additionally, for control of hemlock wooly adelgid and elongate hemlock scale on hemlocks in forested areas. Safari 20SG is available for distribution and use only within the State of Tennessee as a FIFRA Section 24 (c) special local need.

Table 1. Ornamental Pests

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Hemlock Scale	A C E N	Foliage. Small, oblong, dark gray or nearly black, undersides of needles; needles drop prematurely.	dormant oil horticultural oil, Talus, TriStar, Distance, Dimethoate, Safari	February-March April, May, August
Hemlock Woolly Adelgid		<p>root zone</p> <p>trunk injection</p> <p>Trunk Spray</p> <p>underside of foliage</p>	<p>Drench with Merit, Discus, Allectus SC, Marathon, Meridian, Safari</p> <p>Imicide</p> <p>Safari</p> <p>Merit, Marathon II, Flagship, Discus, Allectus SC, Meridian, TriStar, Safari</p> <p>insecticidal soap, horticultural oil</p>	<p>Mid-March to Mid-June or late August-early December. Note that Safari 20SG can be used on ornamental hemlock in landscapes and nurseries. Additionally, for control of hemlock wooly adelgid and elongate hemlock scale on hemlocks in forested areas. Safari 20SG is available for distribution and use only within the State of Tennessee as a FIFRA Section 24 (c) special local need.</p> <p>One week before to 2 weeks after leaf out in the spring or during September, about a month before partial leaf shed.</p> <p>mid-May to mid-June or late July-October</p> <p>May-September, October-April Note: if using horticultural oil, use a 1% spray solution from May-September and a 2% spray solution from October-April.</p>
HICKORY				
Giant Bark Aphid	E N A	See under CHESTNUT.		
Hickory Leafstem Gall Phylloxera	E N A	Twigs of hickory	<p>dormant oil</p> <p>Sevin, Carbaryl, Diazinon, Malathion, Merit, Dursban</p>	<p>Treat overwintering eggs with dormant oil spray in March.</p> <p>Control stem mothers in April at bud split.</p>
Twig Girdler	A	Twigs girdled by adult break off and fall to ground.	Chemical control is not practical.	Rake and destroy fallen twigs in the late fall, winter, spring and early Summer.
Twig Pruner	L	See under CHESTNUT.	Chemical control is not practical.	Rake and destroy fallen twigs before April 1.
Hickory Horned Devil	L	Largest native caterpillar 4 to 5 inches long. The green body is covered with spines and has	No controls needed. Usually occur in small numbers.	July, August, September

Table 1. Ornamental Pests

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		long, reddish spines in back of the head.		
Hickory Bark Beetle	E L P A	Leaf petioles, twigs, bark of trunk.	Water trees during periods of drought. permethrin (Astro, Perm-Up and others)	June, July, August
Hickory Spiral Borer	E L A	Terminal twigs under bark, spiral burrows, twigs break off and fall.	Rake and destroy fallen twigs before April.	May, July
Hickory Tussock Moth	L	Larvae feed on leaves.	Sevin, Carbaryl, Malathion, Dylox, Dimilin, Conserve SC, SpinTor, Mimic, Acelepryn, Talstar, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others), DeltaGard, Tempo, Decathlon, Scimitar	May, August

HOLLY

Holly Leafminer	A & L	upper and undersides of leaves on American, English holly (see native holly leafminer)	Merit, Discus, Marathon, Diazinon, Dylox, Orthene, Dursban, Dimethoate, MSR Spray Concentrate	May Don't use Dimethoate or Cygon on Burford holly. Use Merit, Marathon, MSR Spray Concentrate, Orthene, Cygon or Dimethoate for control of mining larvae.
Holly Scale	N	leaves and twigs of hollies	horticultural oil, Safari, TriStar, Distance, Talus	April-May
Native Holly Leafminer	A	foliage of inkberry	Orthene, Dimethoate, Dylox, Dursban, Merit, Marathon, Discus	May-July Don't use Dimethoate or Cygon on Burford holly. Use Merit, Marathon, MSR Spray Concentrate, Orthene, Cygon or Dimethoate for control of mining larvae.

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Mulberry Whitefly	N, A	underside of foliage - the pupa is shiny black with a fringe of cottony, white wax filaments.	horticultural oil, Mavrik Aquaflow, Merit, Discus, Tempo, Marathon, Tempo SC Ultra, insecticidal soap, Decathlon, Azatin, Ornazin, Endeavor, Flagship, TriStar, Safari, Meridian, Allectus SC, Arena, Talus	Spring and Summer
Two-lined Spittlebug	N	Thatch control is important in preventing and controlling spittlebugs on lawns. Proper dethatching and fertilization practices can disrupt the humid conditions essential for spittlebugs. Mow and then irrigate several hours before making an insecticide application to turf.	Diazinon, Dursban, Orthene, Sevin, Mavrik Aquaflow, Talstar	May-September on turf
	A	Foliage	Orthene, Dursban, Tempo, Decathlon, Tempo SC Ultra	June-September on holly foliage
Cottony Camellia Scale	A	Primarily on underside of leaves.	dormant oil	February-March
	E N A		horticultural oil, Sevin, Carbaryl, Tempo, Decathlon, Dursban, Diazinon, Malathion, Merit, Marathon, Discus, Flagship, Safari, TriStar, Distance, Allectus SC, Arena, Talus	May-June
Indian Wax Scale	A		dormant oil	February-March
	C N		Merit, Marathon, Discus, Dursban, Orthene, Dimethoate, Flagship, Talus, Safari, TriStar, Distance, Allectus SC	Applications of systemic insecticides should be made in late April. Wait until mid-May to make foliar applications of other listed insecticides. A second foliar application should be made 10-14 days after the first application. Since there are 2-3 generations per year, spray again with the two spray regiment whenever crawlers are seen emerging. Don't use Dimethoate on Burford holly.
Southern Red Mite	E	Undersides of leaves of <i>Ilex</i> ,	dormant oil	February-March

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	L N A	especially <i>convexa</i> . Also other broadleafed evergreens.	Hexygon, horticultural oil, insecticidal soap, Floramite, TetraSan, Judo, Forbid, Avid	April-May, August-October Two sprays made one week apart. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
HONEYLOCUST				
Mimosa Webworm	L	Leaves webbed together and skeletonized.	Sevin, Dylox, Dursban, Talstar, Tempo, Scimitar	June-July August-September
Honeylocust Plant Bug	N	Examine expanding leaflets for the small, green nymphs and treat before distortion, stunting and discoloration of foliage occurs.	insecticidal soap, horticultural oil, Sevin, Carbaryl, Dursban, Tempo, Decathlon, Talstar,, Tempo SC Ultra, Scimitar, Flagship	April
Honeylocust Pod Gall Midge	L	Leaves. Causes leaf galls.	Sevin, Carbaryl, Conserve SC, Meridian, Flagship	Treat growing tips as soon as growth starts in the spring. Re-treat at 10-day intervals until infestation is cleaned up.
Honeylocust Spider Mite	E L N A	Foliage	Hexygon, horticultural oil, insecticidal soap, Avid, TetraSan, Judo, Forbid	April-September Two to three sprays made 7 days apart. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.

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JUNIPER				
Bagworm	L	Foliage	Dimethoate, Talstar, Tempo, Mimic Mavrik Aquaflow, Decathlon, Orthene, Tempo SC Ultra, Diazinon, Sevin, Carbaryl, Malathion, Dursban, Dylox, Bt (Dipel, Javelin, and others), Conserve SC, SpinTor, Acelepryn	late May-June
Juniper Scale	All	Leaves and stems	Dormant oil horticultural oil, Sevin, Malathion, Talus, Dursban, Orthene, Safari, Distance, TriStar	February – March late April-May
Juniper Webworm	L	Foliage of juniper, grayish when covered	Dursban, Orthene, Acelepryn, Talstar, Onyx, Onyx Pro, Tempo, permethrin (Astro, Perm-Up and others), Decathlon, Scimitar, DeltaGard	March-April, August
Spruce Mite	E, N, A	Foliage, especially inner foliage	dormant oil Hexygon, Avid, horticultural oil, insecticidal soap, Dimethoate, MSR Spray Concentrate, Floramite, TetraSan, Judo, Forbid, Shuttle	Februay-March April, October Two sprays made one week apart. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.

LILAC				
Melon Aphid	All	Undersides of leaves	Merit, Marathon, Discus, Diazinon, Orthene, Safari, Dursban, Endeavor, Flagship, TriStar, Allectus SC, Meridian	April-September
Lilac Borer	L	Bark of trunk and larger branches, especially around wounds of lilac	Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	Mid-April and mid-June for lilac and privet. Entomopathogenic nematodes can be applied to the trunk from May to September to control borers in an infested tree or shrub. Dursban or permethrin can be used 2 weeks after using entomopathogenic nematodes.
Lilac Leaf Miner	L	Leaves mined and rolled,	Orthene, Talstar, Mavrik Aquaflow,	April-July

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		defoliation occurs	Dursban, Merit, Marathon	
Two-banded Japanese Weevil	L A	Roots, new leaves, shoots, inner foliage. Adults notch leaves, eventually leaving only the petiole.	Orthene, Talstar, Onyx, Onyx Pro	April-September
LOCUST				
Locust Borer	L A	Mine in sapwood, heartwood.	Dursban, permethrin (Astro, Perm-Up and others)	August-September
Locust Leafminer	L A	Leaves. Mine in leaves.	Malathion, Merit, Marathon, Carbaryl, Discus, Sevin, Diazinon, Conserve SC	May, June, July
Blister Beetle	A	Foliage	Sevin, Carbaryl	June-September
MAGNOLIA				
Yellow Poplar Weevil	L A	Leaves. Adults feed on leaves in April and again in May to early June. Larvae mine in leaves in April.	Sevin, Carbaryl, Talstar, Dursban, Scimitar, Orthene, Tempo, Decathlon, Tempo SC Ultra	April, May to early June
Magnolia Borer	E L A	Burrow in trunk near base of tree. Two generations per year.	Dursban, permethrin (Astro, Perm-Up and others), Onyx, Onyx Pro	Early May, early September
MAPLE				
Aphids - numerous species infest maple	E N A	Undersides of leaves, stems and on trunk; honeydew dripping is a nuisance.	Diazinon, Discus, Allectus SC, Merit, Marathon, Malathion, Meridian, Arena, MSR Spray Concentrate, Endeavor, Flagship, TriStar, Safari	April-September
Woolly Alder Aphid	E N A	Curled leaf encloses cottony mass often in thread-like tufts and blue-black aphids.	Diazinon, Meridian, Malathion, Discus, Merit, Marathon, Endeavor, MSR Spray Concentrate, Flagship, TriStar, Safari, Arena	April-July
Norway Maple Aphid	E N A	Often defoliates Norway and sugar maple. Large, hairy green to brown aphid.	horticultural oil, Diazinon, Allectus SC, Merit, Marathon, Discus, Malathion, MSR Spray Concentrate, Endeavor, Flagship, TriStar, Safari, Arena	April, May, June Note: some varieties of maple are oil sensitive
Giant Bark Aphid (Hickory Aphid)		See under CHESTNUT.		
Sugar Maple Borer (Roundheaded borer)	E L	Presence of transverse ridges or elevations on large limbs or	Dursban, permethrin (Astro, Perm-Up and others)	Late May, mid-July

Table 1. Ornamental Pests

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pest of sugar maple)	A	trunk with sawdust-like frass and moisture with rough, cracked bark.		
Maple Callus Borer	E L A	Rough places or wounds on trunk. Larvae bore into sapwood.	Remove larvae from beneath bark in Spring. Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	Early May, late June. Entomopathogenic nematodes can be applied to the trunk from late May to September to control borers in an infested tree or shrub. Dursban or permethrin can be used 2 weeks after using entomopathogenic nematodes.
Maple Spider Mite	E N A	Foliage	Hexygon, Avid, insecticidal soap, Talstar, horticultural oil, Floramite, Ovation SC, TetraSan, Judo, Forbid	May-September Two sprays made one week apart. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
Shoot Boring Caterpillar	E L P A	Small larvae bore into new shoots; leaves wilt and turn black. Spray to control larvae that will be entering terminal twigs. More of a problem on red maple.	Talstar, Onyx, Onyx Pro	Apply a foliar treatment anytime from bud break to when the first two pair of leaves have come out (usually in mid to late April). July-August Other species feed on and web small leaves together. Chemical control is often not needed. Spray at first sign of damage.
Gall-Making Maple Borer	L E P A	Base of small dead twigs on trunk, sapwood and heartwood of trunk; swellings or galls develop over wounds.	Dursban, permethrin (Astro, Perm-Up and others)	April, May, July, August
Leopard Moth	E L P A	Larvae bore into branches and trunk, feed in heartwood; frass or sawdust extruded through holes.	Dursban, permethrin (Astro, Perm-Up and others)	April-August

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Petiole Borer	E L	Small sawflies tunnel in leaf petioles; one third of leaves drop.	Diazinon, Scimitar, Talstar, Tempo, Decathlon, Tempo SC Ultra, DeltaGard, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	Leaf drop will not damage tree. Control recommendations are usually not warranted. Some of the maple petiole borer damage may be prevented by applying insecticide sprays to the trees in mid-April.
Fall Cankerworm	E L A	Leaves skeletonized at tips of branches, leaves completely eaten except for veins by older larvae. Larvae appear as foliage develops in the spring. Slender, green, striped, looping caterpillars. Adults emerge to lay eggs in November and December.	dormant oil Sevin, Carbaryl, Talstar, Bt (Dipel, Javelin and others), Tempo, Scimitar, Decathlon, Tempo SC Ultra, Conserve SC, SpinTor, Mimic, Onyx, Acelepryn, DeltaGard, Onyx Pro, permethrin (Astro, Perm-Up and others) Trap the emerging adult females crawling up the trunk to lay eggs with a sticky adhesive band of Tangle Foot.	February-March April
Spring Cankerworm	E L A	Twigs of maple, elm, oak, beech, linden, others. Inchworm like caterpillars are gray to brown with faint yellow stripes. They appear as foliage develops and can defoliate trees. Adults emerge to lay eggs in late February and March. Can defoliate trees.	dormant oil Sevin, Carbaryl, Talstar, Tempo, Mimic, Bt (Dipel, Javelin, and others), Scimitar, Decathlon, Tempo SC Ultra, permethrin (Astro, Perm-Up and others), Conserve SC, SpinTor, Acelepryn, DeltaGard, Onyx, Onyx Pro Trap the emerging adult females crawling up the trunk to lay eggs with a sticky adhesive band of Tangle Foot.	Mid-to-late March April
Cottony Maple Scale	A E N	Twigs of silver and other maples.	dormant oil horticultural oil Sevin, Carbaryl, Tempo, Decathlon, Malathion, Diazinon, horticultural oil, Dursban, Tempo SC Ultra, Merit, Marathon, Discus, Flagship, Safari, Allectus SC, Arena, Talus	February-March May - June June - July Note: Some varieties of maple are oil sensitive.

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Maple Mealybug	E N A	Bark and twigs of maple.	dormant oil Sevin, Carbaryl, Tempo, Malathion, Diazinon, horticultural oil, Dursban, Merit, Marathon, Discus, Flagship, TriStar, Safari, Allectus SC, Meridian, Arena, Talus	February-March April, May, June, August Note: Some varieties of maple are oil sensitive.
Lecanium Scales	E N A	Dark to reddish-brown circular to oval, strongly convex.	dormant oil Sevin, Carbaryl, horticultural oil, Malathion, Dursban, Merit, Marathon, Discus, Flagship, Safari, TriStar, Distance, Allectus SC, Arena, Talus	February-March June-August Note: Some varieties of maple are oil sensitive. Use Merit or Marathon in May if applying to the root zone.
Oystershell Scale	E N A	Scales resemble miniature oysters on limbs, twigs, trunk.	dormant oil horticultural oil, Safari, TriStar, Distance, Talus	February-March June Note: Some varieties of maple are oil sensitive.
Japanese Maple Scale	E N A	Oyster-shell shaped overlain by grayish white wax.	dormant oil horticultural oil, Safari, TriStar, Distance, Talus, Arena	February-March Mid-May–Mid-July, August–October Note: Some varieties of maple are oil sensitive.
Cottony Cushion Scale	E N A	Brown scales, large white cottony fluted mass with 600 red eggs.	dormant oil Sevin, Carbaryl, horticultural oil, Malathion, Dursban, Merit, Marathon, Discus, Flagship, Safari, TriStar, Distance, Allectus SC, Talus	February-March April, May, June, August Note: Some varieties of maple are oil sensitive.
Potato Leafhopper	N A	Treat foliage for these tiny, light green nymphs and adults. Only the adults can fly.	Sevin, Carbaryl, Diazinon, Dursban, Talstar, Tempo, Decathlon, Scimitar, Tempo SC Ultra, Flagship, Discus, Marathon, Merit, TriStar, Arena, Safari, Talus	Throughout late spring and summer to prevent hopperburn to leaves.
Fall Webworm	E L	Dirty web encloses end of branches.	Malathion, Sevin, Carbaryl, Diazinon, Bt (Dipel, Javelin & others), Dursban, Conserve SC, Mimic, SpinTor, Onyx Acelepryn, Talstar, Onyx Pro, Tempo, DeltaGard, Scimitar, Decathlon, permethrin (Astro, Perm-Up and others)	May, June, August, September
Greenstriped	E	Foliage of maple yellowish-	Sevin, Carbaryl, Mavrik Aquaflox,	May-June, July-August

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Mapleworm	L	green larvae marked above with 8 light- and 7 dark-green stripes. Two generations per year.	Azatin, Tempo, Decathlon, Onyx, Tempo SC Ultra, Bt (Dipel, Javelin, and others), Talstar, Acelepryn, Scimitar, Onyx Pro, permethrin (Astro, Perm-Up and others)	
Maple Pouch Galls (Maple bladder gall)	E N A	Green, red, black galls on upper leaf surface. No appreciable damage to tree vigor.	dormant oil, Sevin, Carbaryl, insecticidal soap, horticultural oil, Judo, Forbid, Avid	Note: Some varieties of maple are oil sensitive. Spray bark in early spring before leaf buds break with dormant oil. Apply any of the other listed insecticides when first leaves are 1/4 expanded and again in 10 days.
(Maple spindle or finger gall)		Green to red spindle shape or fingerlike leaf galls.		
Maple Trumpet Skeletonizer	E L P	Undersides of leaves, larvae spin a long trumpet-like tube of silk and frass, leaves fold around tube.	Sevin, Carbaryl, Diazinon	May-June-July
Forest Tent Caterpillar	L P	Larvae live in colony on silken net on trunks or large limbs; bluish caterpillar with black dots; diamond and white dots alternate on back.	Sevin, Carbaryl, SpinTor, Mimic, Bt (Dipel, Javelin, and others), Onyx, Dursban, Dimilin, Conserve SC, Acelepryn, Talstar, Scimitar, Tempo, DeltaGard, Decathlon, Onyx Pro	April, May, June
Flatheaded Appletree Borer	All	Larvae bore into trunk and feed in phloem and outer sapwood. Newly transplanted trees are very susceptible.	Marathon, Discus, or Merit drench around the base of the tree as an alternative to trunk sprays Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	February to mid-April Early-May, mid-June
Maple Spider Mite	E W A	Foliage	Kelthane, Avid, Hexygon, horticultural oil, insecticidal soap, Floramite, Ornamite, Scimitar, Talstar, Ovation, SC, TetraSan	Two to three sprays made five days apart. Do not use horticultural oil more than once per week. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovidical/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations of if all life stages are present, apply Hexygon in combination with a registered contact adult miticide.

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MIMOSA				
Mimosa Webworm	L	Leaves webbed together and skeletonized.	Sevin, Carbaryl, Dylox, Dursban, Onyx, Talstar, Tempo, Decathlon, Tempo SC Ultra, Scimitar, Onyx Pro, DeltaGard, Acelepryn	June, July, August
OAK				
Aphids	All	Undersides of leaves discolored, distorted, cupped, covered with honeydew.	Merit, Marathon, Discus, Allectus SC, insecticidal soap, horticultural oil, Arena, Orthene, Malathion, Diazinon, Endeavor, Flagship, TriStar, Safari, Meridian	April, May, June-September
Giant Bark Aphid	All	See under CHESTNUT.		
Red Oak Borer (roundheaded borer)	E L P A	Larvae bore into inner bark and sapwood, tunnels extend into near the center of the trunk.	Fertilize trees to maintain vigor. Remove "brood" trees in young timber stands. Dursban, permethrin (Astro, Perm-Up and others)	Early June, mid-July
White Oak Borer (roundheaded borer)	E L P A	Larvae bore into sapwood and heartwood; frass or sawdust is extruded from the borer hole; adults emerge through round holes in the bark.	Dursban, permethrin (Astro, Perm-Up and others)	Early May, June
Columbian Timber Beetle		See under POPLAR.		
Carpenterworm	E L P A	Eggs laid in bark crevices or wound; larvae bore into sapwood and heartwood; large winding tunnels weaken tree.	Dursban, permethrin (Astro,Perm-Up and others)	Mid to late April Spraying oak should coincide with leafing out and flowering of pecan.
Twig Girdler Twig Pruner	E L	See under CHESTNUT. Twig girdler - female lays eggs in twig before chewing a notch around the twig that then falls to the ground.	Chemical control is not practical.	Pick up and burn the fallen twigs.

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Flatheaded Appletree Borer	All	Larvae bore into trunk and feed in phloem and outer sapwood. Newly transplanted trees are very susceptible.	Marathon, Discus, or Merit Drench around the base of the tree as an alternative to trunk sprays. Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	February to mid-April Early-May, mid-June
Twolined Chestnut borer (flatheaded borer)	All	Larvae bore into trunk and feed in phloem and outer sapwood. Newly transplanted trees are very susceptible. Oaks growing vigorously in the nursery may not need protection.	Marathon, Discus, or Merit drench around the base of the tree as an alternative to trunk sprays. Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	February to mid-April Early-May, mid-June
Oak Bark Scarver (roundheaded borer)	All	Larvae feed in bark and pupate in outer sapwood; scars result from feeding.	Dursban, permethrin (Astro, Perm-Up and others)	May, early July Apply first spray when chestnut and chinkapin are in full bloom.
Asiatic Oak Weevil	A	foliage	Talstar, Sevin, Carbaryl, Dursban, Permethrin (Astro, Perm-Up and others)	late June to late August
Oak Sapling Borer (roundheaded borer)	E L P A	Base and roots of oak saplings; base of tree may be hollowed out, causing death of tree or bulb-like swellings at base.	Dursban, permethrin (Astro, Perm-Up and others)	Early May, mid-June
Oak Branch Borer (roundheaded borer)	E L P A	Larvae feeding in small branches cause gall-like swellings.	Dursban, permethrin (Astro, Perm-Up and others)	Mid-May
Ivory Marked Beetle (roundheaded borer)	E L P A	Larvae enter through scars on bark; feed in heartwood.	Dursban, permethrin (Astro, Perm-Up and others)	May, mid-June
Chestnut Bark Borer (roundheaded borer)	E L P A	Larvae feed in thick moist bark in crotches and at base of tree.	Dursban, permethrin (Astro, Perm-Up and others)	May, mid-June
An Oak Borer (clearwing moth)	L	Bark of trunk	Dursban, Onyx, permethrin (Astro and others)	Early June, July 1
Oak Treehopper	N	Egg laying slits in bark can kill	Sevin, Carbaryl, Orthene	May-June, August

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	A	small branches. Two generations per year.		
Oak Sawflies	L	Foliage. They skeletonize the leaves.	Sevin, Carbaryl, Dursban, Orthene, Malathion, Diazinon, Merit, Marathon, Discus, Conserve SC, SpinTor, Allectus SC, Onyx, Onyx Pro, DeltaGard, Scimitar	May-September
Orangestriped Oakworm	L	Black caterpillars with eight longitudinal orange-yellow stripes on back and sides; larvae feed in groups.	Sevin, Carbaryl, Conserve SC, Dursban, Bt (Dipel, Javelin, and others), SpinTor, Decathlon, Tempo, Tempo SC Ultra, Talstar, Scimitar, Acelepryn, Onyx, Onyx Pro, DeltaGard	June, August
Redhumped Oakworm	L	Larvae skeletonize leaves feeding in groups. Later entire leaf is eaten.	Sevin, Carbaryl, Conserve SC, Bt (Dipel, Javelin, and others), Dursban, SpinTor, Decathlon, Tempo, Tempo SC Ultra, Talstar, Scimitar	May, August
Saddled Prominent	L	Young larvae skeletonize upper leaf surface; older larvae eat entire leaf; trees defoliated.	Sevin, Carbaryl, Dursban, SpinTor, Bt (Dipel, Javelin, and others), Conserve SC, Decathlon, Tempo, Tempo SC Ultra, Talstar, Scimitar, Acelepryn, Onyx, Onyx Pro, DeltaGard	June-July
Variable Oakleaf Caterpillar	A L	Larvae skeletonize lower leaf surface and later eat entire leaf.	Sevin, Carbaryl, Dursban, Bt (Dipel, Javelin, and others), Conserve SC, SpinTor, Decathlon, Tempo, Tempo SC Ultra, Talstar, Scimitar, Acelepryn, Onyx, Onyx Pro, DeltaGard	May-June, August-September
Yellownecked Caterpillar	L	Foliage of oak and other hardwoods such as maple, hickory, birch, crabapple, quince, elm, butternut, walnut and locust.	Sevin, Carbaryl, Bt (Dipel, Javelin and others), Dursban, Conserve SC, SpinTor, Decathlon, Tempo, Tempo SC Ultra, Talstar, Scimitar, Acelepryn, Onyx, Onyx Pro, DeltaGard	July-August

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Gypsy Moth	L	Foliage of oak and other hardwoods; young larvae feed on leaf base or leaf surface; older larvae feed from edge of leaf at night.	Sevin, Carbaryl, Bt (Dipel, Javelin, and others), Dimilin, Dursban, Talstar, Tempo, Decathlon, Tempo SC Ultra, Orthene, Conserve SC, SpinTor, Mimic, Onyx, Acelepryn, Onyx Pro, DeltaGard	April-early June
Obscure Scale	N	The scale are a mottled gray that looks like the bark. Scrape the bark to reveal the lighter color on the underside of the scale cover.	dormant oil	February-March
	C		horticultural oil, Safari, Talus, Distance, Arena	Mid-July and again on August 1. Treat when crawlers emerge. This may be earlier than mid-July.
Oak Lecanium Scale	N	Crawlers emerge in June and migrate to leaves. They migrate back to the branches in August to overwinter as second-instar nymphs.	dormant oil	February-March
	C		horticultural oil, Sevin, Carbaryl, Tempo, Decathlon, Tempo SC Ultra, Malathion, Diazinon, Merit, Marathon, Discus, Flagship, Safari, TriStar, Distance, Allectus SC, Arena	June-July A couple sprays about 14 days apart may be needed.
Oak Spider Mite	E	Found on the upper leaf surface of oak, birch, elm chestnut, beech, and hickory.	dormant oil	Early spring before leaf buds break.
	E L N A		Avid, Hexygon, horticultural oil, insecticidal soap, Scimitar, Floramite, TetraSan, Judo, Forbid	May-September Two to three sprays made 5 days apart. Do not use horticultural oil more than once per week. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide
Oak Galls		Numerous galls or growths occur on leaves, stems, buds, twigs and leaf petioles of many plants. Wasps, flies, aphids and mites are the principal gall makers. Most galls do not damage plants except for disfiguring the plant parts. Once formed and developed, there is little stress on the plants. By sheer numbers and deformed growth, some galls interfere with normal plant functions. Leaf galls and twig galls do cause damage in some infestations. Twig galls can cause severe damage or the death of trees. Identity of a gall has to be determined and the life cycle understood before effective control measures can be applied. Send gall specimens to your local county Extension office for identification in the event of a heavy infestation.		No controls are needed in many cases. To be effective, insecticides such as Diazinon, Malathion, Dimethoate, or Sevin must be applied just prior to the time of egg laying and the initial stages of gall development. Some galls can be controlled during the early development stage.

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Oak Phylloxera	E	Bark of trunk and branches.	dormant oil	February- March
	N A	Foliage	Sevin, Carbaryl, Dursban, Tempo, Decathlon, horticultural oil, Merit, insecticidal soap, Discus, Marathon	Treat when nymphs first appear in April-May.
Gouty Oak Gall	E L A	Twigs, irregular, globose, 1 1/2 inches in diameter, frequently confluent, length to 5 inches, surface with round exit holes.	No satisfactory chemical controls.	April - leaf galls Summer - gouty oak gall on twigs and branches
Horned Oak Gall	E A	Twigs. Tubes project like horns. Globose, irregular, woody, variable in size with many horn-like projections.	No satisfactory chemical controls.	April - leaf galls summer - horned oak gall on twigs and branches
Succulent Oak Gall	E L A	Globular gall, succulent, hollow leaf, bud and catkin gall containing a white, free globular kernel, green, sometimes red tinged, diameter 1/4 to 1/2 inch. Spring.	Diazinon, Malathion, Dimethoate, Sevin, Carbaryl	March, April
Wool Sower Gall	E L A	Globular, white, pinkish-marked, woolly growth with seed-like grains on twigs in June, diameter 1 1/2 to 2 inches.	No control needed.	April
PINE				
Bagworm	L	Foliage of many trees. Feed on bark and needles from mid-May through August.	Bt (Dipel, Javelin, and others), Malathion, Diazinon, Orthene, Dursban, Sevin, Tempo, Decathlon, Tempo SC Ultra, Mavrik Aquaflo, Dylox, Conserve SC, SpinTor, Confirm, Mimic, Acelepryn, Onyx, Onyx Pro, DeltaGard	mid-May through August Best control on young larvae from mid-May to mid-June

Table 1. Ornamental Pests

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European Pine Shoot Moth	L	Small area between buds on terminals and laterals; foliage and bark of twigs on Scotch, Mugho, Japanese black pine.	Prune or shear off infested terminals before June. Di-Syston, Dylox, Diazinon, Dimethoate, Orthene, Dimilin, Scimitar, permethrin (Astro, Perm-Up and others), Asana XL, Confirm, Mimic, Acelepryn, DeltaGard, Onyx, Onyx Pro	Early April, June
Nantucket Pine Tip Moth	L P	Tunnel in buds and twigs of young trees up to 10 feet tall. (three generations; use pheromone traps to better time sprays)	Di-Syston, Dylox, Dimethoate, Orthene, Dimilin, Scimitar, Confirm, Mimic, permethrin (Astro, Perm-Up and others), Acelepryn, DeltaGard, Onyx, Onyx Pro	April-August
Pine Bark Adelgid	N	Bark of trunk, branches, and twigs on white pine; also Scotch and Austrian pine.	dormant oil horticultural oil, Dursban, Meridian, Merit, Marathon, Discus, Allectus SC, insecticidal soap, Flagship, TriStar	February-March April-July
Loblolly Pine Sawfly	L	Feed in groups on needles. Red-brown head, dull green body with gray stripes. One inch long. Eats last year's needles only. Trees not killed.	Malathion, Tempo, Decathlon, Tempo SC Ultra, Orthene, Sevin, Carbaryl, Scimitar, Talstar, Conserve SC, SpinTor, Merit, Marathon, Discus, Allectus SC, Onyx, Onyx Pro, DeltaGard	March-May
Pine Sawflies	L	Larvae feed in groups on needles. Olive green or tan with glossy black head. Some have two longitudinal black stripes on back or a row of black spots on each side or a large black spot on last segment. Sawflies usually have 8 pair of fleshy prolegs that lack tiny hooks called crochets. Needles of most conifers especially red, Scotch, white pine and spruce	Malathion, Dursban, Orthene, Sevin, Carbaryl, Scimitar, Talstar, Tempo, Decathlon, Tempo SC Ultra, Conserve SC, SpinTor, Merit, Marathon, Discus, Allectus SC, DeltaGard, Onyx, Onyx Pro	March-October

Table 1. Ornamental Pests

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Red-Headed Pine Sawfly	L	Thorough wetting of needles. Broods may occur throughout the season.	Scimitar, Malathion, Talstar, Dursban, Tempo, Decathlon, Tempo SC Ultra, Orthene, Sevin, Carbaryl, Marathon, Conserve SC, SpinTor, Merit, Discus, Allectus SC, DeltaGard, Onyx, Onyx Pro	May-September
Virginia Pine Sawfly	L	Feed in groups on needles; green body with black spots or stripes, black head; one generation.	Scimitar, Malathion, Talstar, Dursban, Tempo, Decathlon, Tempo SC Ultra, Orthene, Conserve SC, SpinTor, Merit, Marathon, Discus, Allectus SC, DeltaGard, Onyx, Onyx Pro	March-May
Pine Needle Scale	E C N	Needles of white, red, Scotch, Austrian, Mugho pine, spruce.	dormant oil Sevin, Carbaryl, Malathion, Orthene, horticultural oil, Dursban, insecticidal soap, MSR spray concentrate, Safari, TriStar, Distance, Talus	February-March April, July-August when crawlers are emerging.
Pine Needle Miner	A	Foliage of pitch and jack pine.	Dimethoate	May-June
Pine Spittlebug	N A	Foliage (needles), need long residual, especially white pine, also Scotch, red, Japanese.	Malathion, Orthene, Tempo, Decathlon, Tempo SC Ultra	May, July-August
Pine Webworm	L	Foliage (needles) on red, pitch, white pine, usually on seedlings and in plantations.	Scimitar, Malathion, Talstar, Dursban, Tempo, Decathlon, Tempo SC Ultra, Conserve SC, SpinTor, DeltaGard, Onyx, Onyx Pro, Sevin, Carbaryl, Orthene. In the landscape, manual removal of the frass nests on the ends of branches is an alternative to spraying.	June-early September
White Pine Aphid	E N A	Needles of white pine; twigs and small branches of white pine, 1/8" with white marking.	dormant oil Orthene, Malathion, Merit, Marathon, Discus, Diazinon, Tempo, Decathlon, Tempo SC Ultra, Arena, Dibrom, insecticidal soap, horticultural oil, Dursban, Dimethoate, Endeavor, Flagship, TriStar, Safari	February-March April-September
Pine Tortoise Scale	N C		dormant oil Marathon, Discus, Merit, Sevin, Carbaryl,	February-March early June-July

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			Malathion, Orthene, TriStar, horticultural oil, Dursban, insecticidal soap, Safari, Distance, Allectus SC, Arena, Talus	when crawlers are emerging
Pine Tube Moth	L	Needles webbed into tube.	Control rarely warranted. In the landscape, handpick and dispose of pine tubes. Scimitar, Malathion, Onyx, Talstar, Dursban, Tempo, Decathlon, Tempo SC Ultra, Orthene, Conserve SC, SpinTor, DeltaGard, Onyx Pro	May, July
Eriophyid Mites (Rust Mites)	E E N A	Needles discolor and become chlorotic. Rust mites taper from head to tail. They are smaller than spider mites.	dormant oil horticultural oil, Dimethoate, Avid, Sevin, Carbaryl, Judo, Forbid	February-March April-October Two sprays made one week apart. First treat when new growth is 3-5 inches long.
Black Turpentine Beetle	A	One-third to one-fourth inch long, bore vertical tunnel in cambium; larvae bore large gallery adjacent to vertical tunnel; pitch tubes on lower trunk and roots.	Dursban, permethrin (Astro, Perm-Up and others), Onyx, Onyx Pro	April-September
Ips Engraver Beetles	A	One-eighth inch long, crown and upper trunk.	Dursban, permethrin (Astro, Perm-Up and others), Onyx, Onyx Pro	March-September
Southern Pine Engraver	A	Trunk-(mid and lower), 3/16 inch long.	Dursban, permethrin (Astro, Perm-Up and others), Onyx, Onyx Pro	March-September
Eastern Fivespined Ips	A	Trunk--mid and lower, 1/4 inch long; bark with shot holes and pitch tubes; Y- or H-shaped galleries with short lateral to either side in inner bark.	Dursban, permethrin (Astro, Perm-Up and others), Onyx, Onyx Pro	March-September
Southern Pine Beetle	A	S-shaped tunnels in inner bark.	Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others) Remove dying trees.	April-October

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Pales Weevil	L	Stump treatment: Pull and destroy stumps before June or treat stumps in March-early April or after trees are cut and the temperature is above 50 F.	Asana XL (Christmas tree plantings, forest tree nurseries, conifer seed orchards only, stump only), Dursban, Lorsban	
	A	Foliar treatment: The tender bark of seedling conifers and the young twigs of larger conifers can be protected by spraying in early to late April and again in August.	Dursban, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others.)	
Pine Root Collar Weevil	A L	Bark at base of trunk and soil surface 8 inches out from trunk of Scotch, red pine and Austrian pine.	Dursban, Onyx, Onyx Pro permethrin (Astro, Perm-Up and others)	early April
White Pine Weevil	A	Thorough coverage on terminals of white pine, Norway and white spruce, Scotch pine and Japanese black pine.	Dursban, MSR Spray Concentrate, Dimethoate, permethrin (Astro, Perm-Up and others), Talstar, Onyx, Tempo, Scimitar, Decathlon Merit, Marathon, Discus	For Christmas tree growers, spray with MSR Spray Concentrate or Dimethoate 7-10 days after forsythia full bloom and a second application three weeks later. Another option is an application of Talstar or Decathlon when forsythia is in full bloom and again three weeks later. In the landscape, spray with Onyx, Talstar, Tempo, Scimitar, permethrin (Astro, Perm-Up and others) when forsythia is in full bloom. Repeat three weeks later. Apply as a soil drench in October or November to prevent damage the following Spring.
Southern Pine Sawyer (roundheaded borer)	A	Trunk At least two generations per year with overlapping broods.	Dursban, permethrin (Astro, Perm-Up and others)	Late April-early May, mid-July

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POPLAR, YELLOW OR TULIPTREE				
Tuliptree Aphid	E N A	Pale green aphids on underside of leaves; leaves become pale and fall prematurely.	horticultural oil, insecticidal soap, MSR Spray Concentrate, Diazinon, Arena, Malathion, Orthene, Discus, Merit, Marathon, Endeavor, Flagship, TriStar, Safari	April, May, June
Root Collar Borer	E L A	Burrow in trunk near base of tree. Two generations per year.	Dursban, Onyx, Onyx Pro permethrin (Astro, Perm-Up and others)	Early May, early September
Tuliptree Scale	E N A	Twigs and stems.	dormant oil Sevin, Carbaryl, insecticidal soap, Orthene, horticultural oil, Diazinon, Dursban, Discus, Merit, Marathon, Flagship, Safari, TriStar, Distance, Allectus SC, Arena, Talus	February-March Treating in May with Orthene or Merit may aid in control but a follow up treatment of the crawlers in September-early October is required for more complete control.
Columbian Timber Beetle	E L P A	Sapwood of trunk under bark; white dust collects at borer hole; later a sap-soaked area may develop around the hole.	Dursban, permethrin (Astro, Perm-Up and others)	May-June-October
Yellow Poplar Weevil	L A	Leaves; mine in leaves side by side.	Sevin, Carbaryl, Scimitar, Dursban, Orthene, Tempo, Decathlon, Talstar, Tempo SC Ultra, Onyx, Onyx Pro	April, late May-early June
PRIVET				
Privet Aphid	All	New leaves curled lengthwise	Merit, Marathon, Orthene, Discus, Dursban, insecticidal soap, TriStar, horticultural oil, Flagship, Safari, Arena	April-May September
Lilac Borer	L	Trunk	See under LILAC	
Lilac Leaf Miner	L	Leaves	See under LILAC	
European Hornet	A	Bark	See under BOXWOOD	
Mealybugs		Stems and leaves	Merit, Marathon, Discus, Diazinon, Dursban, Arena, Orthene, Flagship, TriStar, Talus	April-June

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Privet Rust Mite	All	Leaves and stems	Dursban, Avid, horticultural oil, Sevin, Carbaryl, Judo, Forbid	April-June Two sprays made one week apart.
Southern Red Mite	E, N, & A	Lower leaf surfaces	Hexygon, Avid, horticultural oil, Floramite, TetraSan, Judo, Forbid	May-June September-October Two sprays made one week apart. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
White Peach Scale	All, E, N & A	Bark of trunk, branches, and twigs or ornamental stone fruits, privet and lilac	Sevin, Carbaryl, Malathion, Dursban, Orthene, horticultural oil, Safari, TriStar, Distance, Talus	April-September
Two-banded Japanese Weevil		Roots, new leaves, shoots, inner foliage. Adults notch leaves, eventually leaving only petiole.	Talstar, Orthene, Onyx, Onyx Pro	April-September
PYRACANTHA				
Apple and Rose Aphids	All, E, N & A	Terminal stems and leaves, undersides of leaves	Merit, Marathon, Discus, Allectus SC, Malathion, Orthene, Dursban, Arena, insecticidal soap, horticultural oil, Endeavor, Flagship, TriStar, Safari, Meridian	April-September
Hawthorn Lace Bug	All, E, N & A	Undersides of pyracantha, cotoneaster or hawthorn leaves	Orthene, Discus, Dursban, Merit, Marathon, Diazinon, Tempo, Allectus SC, Tempo SC Ultra, Decathlon, horticultural oil, Flagship, Acelepryn	mid-May to October

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Southern Red Mite	All	Upper and lower leaf surfaces, leaves turn gray or brown	horticultural oil, Hexygon, insecticidal soap, Scimitar, Floramite, TetraSan, Judo, Forbid	April-May September-October Two sprays made one week apart. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
San Jose Scale	All	Stems and leaves	dormant oil Sevin, Carbaryl, Malathion, Orthene, Dursban, Safari, TriStar, Distance, Talus	February-March April-June August
Webworms	L	Leaves webbed together and turn brown	Bt (Dipel, Javelin & others), Dursban, Sevin, Carbaryl, Malathion, Dylox, DeltaGard, Scimitar, Onyx, Onyx Pro, Acelepryn	June-September

RHODODENDRON

Black Vine Weevil	L	Roots	DeltaGard G, Merit, Marathon, entomopathogenic nematodes	May-September
	A	Foliage, roots. Adults notch the edges of leaves.	Orthene, Talstar, Meridian, Mavrik Aquaflow, Diazinon, Scimitar, Dursban, Tempo, Decathlon, Tempo SC Ultra, Onyx, Onyx Pro	May-September Treat every three weeks until no adults are found. If adults can overwinter in container plants in polyhouses, begin treatment in March-April.
Rhododendron Borer		Trunk and branches	Dursban 50W, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others)	Mid-May and late June
Rhododendron Gall Midge	L P	Tender, new leaves	A soil drench with Diazinon or Dursban from late fall to early spring is directed at	April-September

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(Rhododendron Tip Midge)	A		controlling the overwintering larvae and pupae. One or two additional soil drenches can be made in season between growth flushes in conjunction with the use of Orthene foliar sprays timed to protect each flush of new growth.	
Rhododendron Lace Bug	N A	Underside of leaves	Orthene, Discus, Diazinon, Tempo, Decathlon, Merit, Marathon, Dursban 50W, Tempo SC Ultra, Flagship, Allectus SC, Acelepryn	April-October
Rhododendron Stem Borer	L,A	The primary control is to prune out and destroy wilted branches where eggs have been laid in June to mid-July. Prune below the lower of two girdled areas on the branches.	Rhododendron borer sprays should also help control this pest.	May and July sprays. Prune in the summer.
Cranberry Rootworm	A	Foliage	Dursban	May Spray at first sign of serpentine leaf feeding. Make a second spray 7-10 days later.

ROSE

Rose Chafer	A	Thoroughly wet foliage with a residual spray	Sevin, Carbaryl, Dursban, DeltaGard, Scimitar, permethrin (Astro, Perm-Up and others), Onyx, Onyx Pro, Talstar	May-July
Rose Sawfly	L	Upper and lower surface of foliage, especially on rambler rose	Diazinon, Malathion, Dursban, Orthene, Conserve SC, SpinTor, Merit, Talstar, Marathon, Discus, Allectus SC, DeltaGard, Scimitar, permethrin (Astro, Perm-Up and others), Onyx, Onyx Pro	May-July
Thrips	N & A	Buds and flowers, base of petals	Diazinon, Dimethoate, Dursban, Dylox, Conserve SC, Merit, Marathon	April-September
Japanese beetle	A	The beetles are 3/8 inches long, metallic green with coppery wing covers	Sevin, Carbaryl, Scimitar, Onyx, Onyx Pro, Talstar, DeltaGard	June, July & early August (spray weekly)
Twospotted Spider Mites	N & A	foliage	Isotox IV, Avid, Hexygon, horticultural oil, insecticidal soap, Floramite, Ovation SC, Judo, Forbid, Shuttle	April-September

SPRUCE

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Spruce Mite	E N A	Needles turn yellow, webbing between leaves	dormant oil Hexygon, Avid, insecticidal soap, horticultural oil, Floramite, TetraSan, Shuttle	February-March April, September-October Two sprays made one week apart. Hexagon should only be used once per crop cycle or once per year and since it is mostly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
Hemlock Eriophyid Mite (Rust Mites)	E N A	Needles with grayish cast, feed on upper and lower needle surfaces.	dormant oil horticultural oil, Sevin, Carbaryl, Avid, Dimethoate, Judo, Forbid	February-March April-May Two sprays made one week apart.
Hemlock Scale	A C E N A	Foliage. Small, oblong, dark gray or nearly black, undersides of needles; needles drop prematurely.	dormant oil horticultural oil, Diazinon, Sevin, Carbaryl, Malathion, Safari, TriStar, Distance, Talus	February-March April, May, August
Pine Needle Scale	E C N	Needles	dormant oil Sevin, Carbaryl, Malathion, Orthene, horticultural oil, Dursban, insecticidal soap, Metasystox-R, Safari, TriStar, Distance, Talus	February-March April, July-August when crawlers are emerging.
Pine Bark Adelgid	A E N A	Bark of trunk, branches, and twigs	dormant oil horticultural oil, Diazinon, Dursban, Merit, Marathon, insecticidal soap, Discus, Flagship, Allectus SC, Meridian	February-March April-July
Pine Spittlebug	N A	Foliage (needles), need long residual	Diazinon, Malathion, Orthene, Tempo, Decathlon, Tempo SC Ultra	May, July-August
Bagworm	L	Foliage of many trees. Feed on bark and needles from mid-	Bt (Dipel, Javelin, and others), Malathion, Diazinon, Orthene, Dursban, Sevin,	Mid-May-August Best control on young larvae from mid-

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		May through August.	Tempo, Decathlon, Tempo SC Ultra, Mavrik Aquaflo, Dylox, Conserve SC, SpinTor, Confirm, Mimic, Acelepryn, DeltaGard, Scimitar, Onyx, Onyx Pro	May to mid-June
Sawflies	L	Larvae feed in groups on needles. Sawflies usually have 8 pair of fleshy prolegs that lack tiny hooks called crochets. Needles of most conifers.	Malathion, Diazinon, Dursban, Orthene, Sevin, Carbaryl, Scimitar, Talstar, Tempo, Decathlon, Tempo SC Ultra, SpinTor, Merit, Marathon, Discus, Allectus SC, DeltaGard, Scimitar, Onyx, Onyx Pro	March-October
Ips Engraver Beetles	A	One-eighth inch long, crown and upper trunk.	Dursban, permethrin (Astro, Perm-Up and others)	March-September
White Pine Weevil	A	Thorough coverage on terminals of Norway and white spruce.	Dursban, MSR Spray Concentrate, Dimethoate, Permethrin (Astro, Perm-Up and others), Talstar, Onyx, Onyx Pro, Tempo, Decathlon, Scimitar Merit, Marathon	For Christmas tree growers, spray with MSR Spray Concentrate or Dimethoate 7-10 days after forsythia full bloom and a second application three weeks later. Another option is an application of Talstar or Decathlon when forsythia is in full bloom and again three weeks later. In the landscape, spray with Onyx, Talstar, Tempo, Scimitar, permethrin (Astro, Perm-Up and others) when forsythia is in full bloom. Repeat three weeks later. Apply as a soil drench in October or November to prevent damage the following Spring.
Pales Weevil	L A	Stump treatment: Pull and destroy stumps before June or treat stumps in March-early April or after trees are cut and the temperature is above 50 F. Foliar treatment: The tender bark of seedling conifers and the young twigs of larger conifers can be protected by spraying in early to late April and again in August.	Asana XL (Christmas tree plantings, forest tree nurseries, conifer seed orchards only, stump only), Dursban, Lorsban Dursban, Onyx, Onyx Pro	

SWEET GUM

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Table 1. Ornamental Pests

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Fall Webworm		See under CHESTNUT.		
	L	Leaves webbed or tied together.	Dylox, Sevin, Carbaryl, Talstar, Onyx, Onyx Pro, Scimitar, DeltaGard, Tempo, Decathlon, permethrin (Astro, Perm-Up and others), Acelepryn, DeltaGard	June, July
Terrapin Scale	A	Twigs and stems.	dormant oil	February-March
	All		Diazinon, Malathion, Sevin, Carbaryl, Dursban, Orthene, Merit, Discus, Marathon, Flagship, TriStar, Talus, Distance, Allectus SC, Safari, Arena	June, July
Sweetgum Scale	A	Pit on underside of leaf; small discolored galls occur on upper surface.	dormant oil	February-March
	All		Malathion, Sevin, Carbaryl, Dursban, Orthene, TriStar, Distance, Safari, Talus	May-June, August

SYCAMORE

Fall Webworm		See under CHESTNUT.		
Sycamore Lace Bug	N A	Underside of leaves; foliage stippled, turns white, drops prematurely.	Malathion, Sevin, Carbaryl, Discus, Marathon, Merit, Flagship, Acelepryn, Allectus SC	May, September

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VIBURNUM				
Snowball Aphid	N & A	Foliage of Viburnum	Merit, Marathon, Orthene, Dursban, Endeavor, Flagship, TriStar, Safari, Allectus SC, Discus, Arena	April-May
WALNUT				
Giant Bark Aphid		See under CHESTNUT.		
Fall Webworm		See under CHESTNUT.		
Walnut Caterpillar	E L	Larvae feed in colonies.	Bt (Dipel, Javelin and others), Malation, Diazinon, Orthene, Dursban, Sevin, Tempo, Decathlon, Tempo SC Ultra, Mavrik Aquaflo, Dylox, Conserve SC, SpinTor, Mimic, Onyx, Acelepryn, Confirm, DeltaGard, Scimitar, Onyx Pro, Carbaryl, Talstar	May, June, August, September
Walnut Petiole Gall Mite	E N A	Twigs and bark before new growth begins. Large, deformed, hairy growths on leaf petiole.	Sevin, Carbaryl, Avid	April-May
Butternut Gall Mite	All	Twigs and bark before new growth begins.	Sevin, Carbaryl, Avid	April, May
WILLOW and POPLAR				
Giant Bark Aphid		See under CHESTNUT.		
Cottonwood Leaf Beetle Imported Willow Leaf Beetle	L P A	Larvae feed in groups; leaves skeletonized by young larvae. Older larvae consume entire leaf except veins.	Orthene, Sevin, Carbaryl, Talstar, Dursban, Conserve SC, Merit, Marathon, Discus, Allectus SC	April, May, September

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Twospotted Spider Mite	E N A	Heavy infestation causes browning and cupping of undersides of leaves.	Hexygon, horticultural oil, Isotox IV, insecticidal soap, Avid, Floramite, Ovation SC, TetraSan, Judo, Forbid, Shuttle	May-September Two to three sprays made 5 days apart. Do not use horticultural oil more than once per week. Hexygon should only be used once per crop cycle or once per year and since it is predominantly ovicidal/larvicidal, it should be applied prior to adult mite buildup. If adult mites are present in medium to high populations or if all life stages are present, apply Hexygon or TetraSan in combination with a registered contact adult miticide.
Willow Sawfly	E L A	Young larvae feed in colonies; entire leaf eaten.	Diazinon, Malathion, Talstar, Tempo, Tempo SC Ultra, Decathlon, Conserve SC, Orthene, SpinTor, Merit, Marathon, Discus, Allectus SC, DeltaGard, Onyx, Onyx Pro, Scimitar	May-September
Elm Sawfly	L A	Feed on bark of small twigs and leaves.	Malathion, Diazinon, Talstar, Tempo, Tempo SC Ultra, Decathlon, Conserve SC, Orthene, SpinTor, Merit, Marathon, Discus, Allectus SC, DeltaGard, Onyx, Onyx Pro, Scimitar	May, August
Willow Shoot Sawfly	E L	Larvae bore in pith killing shoots.	Diazinon, Talstar, Tempo, Tempo SC Ultra, Decathlon, Conserve SC, Orthene, SpinTor, Merit, Marathon, Discus, Allectus SC, DeltaGard, Onyx, Onyx Pro, Scimitar	May, June
Poplar Tentmaker	L	Feed on the foliage of poplar and willow. They make a protective nest out of leaves and silk.	Dursban, Othene, Sevin, Carbaryl, Bt (Dipel, Javelin and others), Malathion, Diazinon, Tempo, Decathlon, Talstar, Scimitar, permethrin (Astro, Perm-Up and others), Tempo SC Ultra, Acelepryn, Onyx, Onyx Pro, DeltaGard	May-October
Cottonwood Borer (roundheaded borer)	A L	Base of trunk under bark; base of tree riddled by tunnels.	Dursban, permethrin (Astro, Perm-Up and others)	early June, mid-July

Table 1. Ornamental Pests

Revised 3/12

YEW				
Asiatic Garden Beetle	L & A	Foliage stripped off at night by adult, roots cut by white grub.	Sevin, Orthene, Dursban	May-July
Taxus Mealybug	N	Bark of trunk and large branches	dormant oil	February-March
	N	Bark of small branches and twigs	Orthene, Malathion, Sevin, Carbaryl, Diazinon, , Merit, Discus, Marathon, Flagship, TriStar, Safari, Arena, Talus	May, July
Cottony Taxus Scale (cottony camellia scale)	N	Bark of twigs and branches of taxus	dormant oil	February-March
	N	Same as above	Sevin, Carbaryl, Dursban, Tempo, Decathlon, Merit, Marathon, horticultural oil, Tempo SC Ultra, Flagship, Safari, TriStar, Distance, Discus, Allectus SC, Arena, Talus	May-June
Taxus Weevil (Black Vine Weevil)	A	Foliage, bark of trunk and branches, and the surfaces of ground beneath where beetles walk after emerging. Adults notch the edges of leaves.	Tempo, Decathlon, Diazinon, Orthene, Dursban, Talstar, Tempo SC Ultra, Mavrik Aquaflow, Meridian	May-September Treat every three weeks until no adults are found. If adults can overwinter in container plants in polyhouses begin treatments in March-April.
	L	Roots	DeltaGard G, Merit, Marathon, Discus, entomopathogenic nematodes	May-September
Fletcher Scale	N	See under ARBORAVITAE	see under ARBORAVITAE	
	C	See under ARBORAVITAE	see under ARBORAVITAE	
YUCCA				
Termites	N & A	Roots, lower trunk	Merit, Marathon, Discus (soil drench)	April

Table 1. Ornamental Pests

Revised 3/12

Yucca Plant Bug	E, N & A	Leaves and stems	Orthene, Sevin, Carbaryl, Decathlon, Tempo, Talstar, Onyx, Onyx Pro, DeltaGard, permethrin (Astro, Perm-Up and others), Scimitar, Discus, Allectus SC	May-October
Stalk Borer	L	Tunnels in the stems, wilted plants have a hole in stem from which frass has been extruded	Diazinon, Dursban, Talstar, Tempo, Decathlon, Tempo SC Ultra, Onyx, Onyx Pro, permethrin (Astro, Perm-Up and others), DeltaGard, Scimitar	May-June
Scale	C	Stems and leaves	Sevin, Carbaryl, Malathion, Dursban, Orthene, horticultural oil, Safari, Talus, TriStar, Distance, Discus, Allectus SC	April-June August

Table 2. Insect and Mite Control Recommendations for Flowers

Listed Insecticides can be easily measured and/or mixed in amounts sufficient to treat small to medium size areas

Pest	Insecticide Formulations	Amount to use per gallon	Precautions and Remarks
ANTS	Malathion 57% EC	2 tsp	Locate nests or trails. Apply as a localized treatment to nesting area. A general area treatment may be necessary. Slow acting insecticide baits are recommended for certain ants including imported fire ants. See Commercial Turfgrass Insect Control, PB 1342.
APHIDS	Malathion 57% EC	2 tsp	Repeat applications are usually needed. Malathion is ineffective during cool, wet weather. Use Orthene with caution on Gloxinia, Philodendron and Salvia when repeated applications are needed. Dimethoate should not be applied to chrysanthemums or any other plant not on the label. Dimethoate is for commercial ornamental (nursery) use.
	Orthene 9.4% EC	2 Tbs	
	Dimethoate 400 4 lb/gal EC	See label	
	horticultural oil (SunSpray Ultra-Fine Spray Oil)	2.5-5 Tbs	
	Marathon 60% WP	see label	
	Marathon II	see label	
	Merit 75% WP	0.25 tsp/2.5 gal	Dimethoate for use on poinsettia, roses, iris, honeysuckle, gladiolus, gardenias, gerberas, carnations, daylilies, azaleas and camellias.
	Merit 2 lb/gal F	0.46-0.6 fl oz per 1000 sq ft	
	Discus	see label	
	Safer Insecticidal Soap	5 Tbs	
	Bayer Advanced 2-in-1 Systemic Rose & Flower Care 1%G	see label	
ARMYWORMS	Sevin 80% WP	2 1/2 Tbs/3 gal for each 100 sq ft	Sevin injures Boston ivy, Virginia creeper and maidenhair ferns.
	Orthene 9.4% EC	3 Tbs	Spray when insects are present or when feeding injury is first noticed.
	Conserve 1 lb/gal SC	0.06 fl oz (2 ml)	
BLISTER BEETLE JUNE BEETLE JAPANESE BEETLE FLEA BEETLE	Sevin 50% WP	2 Tbs	See precautions under Armyworms.
CABBAGE LOOPER	Sevin 50% WP	2 Tbs	Spray when worms are 1/8 to 1/4 inch long. Mature worms 1/2 to 1 inch long are difficult to control. Hand pick and destroy to protect flowers.
	Bacillus thuringiensis, Bt (Javelin WG, Steward, Dipel)	Follow label	
	Conserve 1 lb/gal SC	0.06 fl oz (2 ml)	
	Tempo SC Ultra	See label	
	Astro 3.2 EC Perm-Up 3.2 EC	See label See label	
	Scimitar 10% WP	See label	

Table 2. Insect and Mite Control Recommendations for Flowers

Pest	Insecticide Formulations	Amount to use per gallon	Precautions and Remarks
CANNA LEAF ROLLER	Orthene 9.4% EC	3 Tbs	
	Bayer Advanced 2-in-1 Systemic Rose & Flower Care 1%G	see label	
CORN EARWORM	Conserve 1 lb/gal SC	0.06 fl oz (2 ml)	Spray thoroughly and repeat as needed.
	Sevin 50% WP	2 Tbs	
	Tempo SC Ultra	see label	
	Astro 3.2 EC Perm-Up 3.2 EC	see label see label	
	Scimitar 10% WP	see label	
EUROPEAN CORN BORER	Conserve 1 lb/gal SC	0.06 fl oz (2 ml)	Spray thoroughly
	Sevin 50% WP	2 Tbs	
	Tempo SC Ultra	see label	
	Astro 3.2 EC Perm-Up 3.2 EC	see label see label	
	Scimitar 10% WP	see label	
COMMON STALK BORER	Orthene 9.4% EC	3 Tbs	
	Bayer Advanced 2 in 1 Systemic Rose & Flower Care 1%G	see label	
IRIS BORER	Dimethoate 400 4 lb/gal EC	see label	Apply to foliage in early spring when leaf fans are about 6 inches tall. Repeat in 10 to 14 days. Rogue infested, decaying tubers from bed and destroy. Remove leaf litter and plant debris from bed in late fall.
LEAFHOPPER	Orthene 9.4% EC	3 Tbs	Apply to foliage as needed. See precautions under aphids. Dimethoate for use on poinsettia, iris, roses, honeysuckle, gladiolus, gardenias, gerberas, carnations, daylilies, azaleas and camellias.
	Dimethoate 400 4 lb/gal EC	see label	
	Bayer Advanced 2 in 1 Systemic Rose & Flower Care 1%G	see label	
LEAFMINERS	Orthene 9.4% EC	3 Tbs	Apply to foliage thoroughly - kills larvae in leaves. Only use Dimethoate on plants listed on the label. Dimethoate is for commercial ornamental (nursery) use.
	Dimethoate 400 4lb/gal EC	see label	
	Marathon 60% WP	see label	
	Merit 75% WP	0.25 tsp/2.5 gal	
	Merit 2 lb/gal F	0.46-0.6 fl oz per 1000 sq ft	
	Marathon II	see label	
	Discus	see label	
	Bayer Advanced 2 in 1 Systemic Rose & Flower Care 1%G	see label	

Table 2. Insect and Mite Control Recommendations for Flowers

Pest	Insecticide Formulations	Amount to use per gallon	Precautions and Remarks
PLANT BUGS	Sevin 50% WP	2 Tbs	Apply to foliage as needed.
	Malathion 57% EC	2 tsp	
	Orthene 9.4% EC	3 Tbs	
	Pyrethrins and various labeled pyrethroid insecticides	see label	
SLUGS AND SNAILS	Metaldehyde + Sevin B	Follow label directions	Apply baits around plant bed borders in early evening. Moisten bait with a mist spray. Remove boards, plant debris and leaf litter from area to permit soil to dry and to reduce shelter for pests.
	Mesuroil 75% WP	2 lb/acre in 50 gal water	
SOWBUG, PILLBUGS AND MILLIPEDE	Sevin 50% WP	2 Tbs	Spray or dust flower beds, leaf litter, lawn areas around house and flower beds.
SPIDER MITES	horticultural oil (SunSpray Ultra-Fine Spray Oil)	2.5-5 Tbs	Spray foliage thoroughly when infestation appears. Two to three sprays made 5 days apart. Do not use horticultural oil more than once per week.
	Avid 0.15 lb/gal EC	0.24 tsp	
	Floramite 50% WP	1/3-2/3 tsp.	
	Safer Insecticidal Soap	5 Tbs	
	Ovation SC	see label	
	Isotox IV	3 Tbs	
	Bayer Advanced 2 in 1 Systemic Rose & Flower Care 1%G	see label	
SPITTLEBUGS	Orthene 9.4% EC	3 Tbs	Spray foliage when infestation occurs.
	Bayer Advanced 2 in 1 Systemic Rose & Flower Care 1%G	see label	
SCALE INSECTS	horticultural oil (SunSpray Ultra-Fine Spray Oil)	2.5-5 Tbs	Spray when infestation occurs. Spray when scale crawlers are migrating on plants.
	Malathion 57% EC	2 tsp	
	Safer Insecticidal Soap	5 Tbs	
	Marathon 60% WP	see label	
	Marathon II	see label	
	Merit 75% WP	0.25 tsp/2.5 gal	
	Merit 2 lb/gal F	0.46-0.6 fl oz per 1000 sq ft	
	Discus	see label	

Table 2. Insect and Mite Control Recommendations for Flowers

Pest	Insecticide Formulations	Amount to use per gallon	Precautions and Remarks
MEALYBUGS	horticultural oil (SunSpray Ultra-Fine Spray Oil)	2.5-5 Tbs	
	Malathion 50% EC, 57% EC	2 tsp	
	Safer Insecticidal Soap	5 Tbs	
	Orthene 9.4% EC	3 Tbs	
	Marathon 60% WP	see label	
	Marathon II	see label	
	Merit 75% WP	0.25 tsp/2.5 gal	
	Merit 2 lb/gal F	0.46-0.6 fl oz per 1000 sq ft	
NARCISSUS BULB FLIES	Dylox 80% SP	0.2 oz	
THRIPS	Azatin XL 3% EC	0.6-1 tsp	Spray foliage and buds when pest occurs. Repeat sprays will be needed. Only use Dimethoate on plants listed on the label. Dimethoate is for commercial (nursery) use.
	Bioneem 0.3% EC	2.5-5 tsp	
	Orthene 9.4% EC	3 Tbs	
	Malathion 57% EC	2 tsp	
	Sevin 50% WP	2 Tbs	Dimethoate for use on poinsettia, iris, roses, honeysuckle, gladiolus, gardenias, gerberas, carnations, daylilies, azaleas and camellias.
	Dimethoate 400 4 lb/gal EC	see label	
	Conserve 1 lb/gal SC	0.06 fl oz (2 ml)	
	Bayer Advanced 2 in 1 Systemic Rose & Flower Care 1%G	see label	
WHITEFLIES	Orthene 9.4% EC	1 Tbs	Spray underside of leaves when pests appear. Repeat when infestation occurs throughout season. Only use Dimethoate on plants listed on the label. Dimethoate is for commercial (nursery) use.
	Dibrom 8 lb/gal EC	2 tsp	
	Dimethoate 400 4 lb/gal EC	see label	
	Bioneem 0.3% EC	2.5-5 tsp	
	horticultural oil (SunSpray Ultra-Fine Spray Oil)	2.5-5 Tbs	Dimethoate for use on poinsettia, iris, roses, honeysuckle, gladiolus, gardenias, gerberas, carnations, daylilies, azaleas and camellias.
	insecticidal soap	5 Tbs	
	Marathon 60% WP	see label	
	Marathon II	see label	
	Merit 75% WP	0.25 tsp/2.5 gal	
	Merit 2 lb/gal F	0.46-0.6 fl oz per 1000 sq ft	
	Discus	see label	
	Bayer Advanced 2 in 1 Systemic Rose & Flower Care 1%G	see label	
WEBWORMS	Dylox 80% SP	0.2-0.3 oz	Spray foliage when insects appear.

Preparing A Spray

Rev. 2/11

Pesticides are formulated as emulsifiable concentrates or wettable powders for dilution in water or as granules to be applied on or in the soil. Accurately measure the amount recommended for the volume of dilute spray you need. The concentrates may contain either one, two, three, four or seven pounds per gallon of the active insecticidal ingredient. The safety margin is reduced considerably when too much insecticide is added to the dilute spray. Injury to plants and overexposure to the home gardener frequently results from using too much insecticide.

Read the label thoroughly before you mix a spray. The four most important minutes in any pest control project are the time required to read and understand the label.

Overexposure to insecticides can result from oral ingestion, inhalation or absorption through the skin. The amount any one individual can tolerate without becoming ill may vary according to age, weight, sex and health. The potential toxicity is based on test results with experimental animals. The insecticides Di-Syston, Metasystox-R2 and Diazinon have a high dermal absorption potential. The oral poisoning potential for these insecticides is extremely high. Observe the caution and warning statements on all insecticide labels. Wear the prescribed protective equipment and apply the insecticides in recommended situations according to label directions.

The potential toxicity is increased many times when the amount recommended for a spray application is doubled. Mixing two or more insecticides together can also greatly increase the potential toxicity of a spray.

Table 3. Spray Estimate Chart

Estimate the amount of dilute spray material required to thoroughly cover your infested plants to the point of run-off. When the spray begins to drip off, you have applied a sufficient amount. A fine-mist spray will give a better, more uniform coverage to the plant.

Spraying Trees or Shrubs	Height of Plant (Feet)	Spread of Plant	Square Feet of Bark Surface	Volume Needed (Gallons)
Foliage Spray	50	60		25
Dilute Spray	30	35		20
Fine-Mist Spray	25	30		15
	19	26		14
	16	24		13
	13	20		12
	10	16		8
	8	12		6
	6	8		4
	4	3		1/2
Bark Spray			80-125	1 pint
Borers	Trunk up to and including lower limbs of scaffold		80-125	1 pint

Table 4. Pesticide Formulations

Common Name	Class	Brand Names	Formulations	Amounts to Use	
				100 gallons	1 gallon
acephate	OP	Orthene Turf, Tree & Ornamental Spray	75% SP	1/3-1 1/3 lb	1-4 tsp
acephate plus hexakis	OP OG	Isotox IV	8% acephate plus 0.5% hexakis	----	3 TBS
acequinocyl	ND	Shuttle 15 SC	15% SC	6.4 fl. oz. for roses 6.4-12.8 fl. oz. for floral, foliage and ornamental nursery crops (other than roses). Do not use on miniature roses or impatiens.	---- ----
acetamiprid	CN	TriStar 70WSP	70% WSP	1 packet for aphids, European pine sawflies, 2 packets for tentform leafminer, mealybug, leafhopper, 2-4 packets for whiteflies, 3-6 packets for citrus thrips.	----
avermectin B ₁	B	Avid	0.15% EC	4 fl oz	0.24 tsp
azadirachtin	BOT	Ornazin 3% EC OHP Azatin XL Bioneem	3% EC 3% EC 0.3% EC	8-10 fl. oz. 10-16 fl oz 10-16 fl oz	0.5-0.6 tsp. 0.6-1 tsp 2.5-5 tsp
<i>Bacillus thuringiensis</i>	B	Dipel Pro DF	54% DF	0.25-2 lb/acre	0.5-4 tsp.
bifenazate	CBZ	Floramite	50% WP	2-4 oz	----
bifenthrin	P	Talstar F	7.9% F	5.4-43.5 fl. oz.	----
		Talstar One	7.9% F	5.4-43.5 fl. oz.	----
		Talstar Nursery	7.9% F	5-40 fl oz per acre	----
		Onyx, Onyx Pro	23.4%	0.26-1.28 fl. oz./10 gallons 6.4-12.8 fl. oz./100 gal. for clearwing borers and coleopteran borers	----
carbaryl	Car	Carbaryl Sevin	80% S 4 lb/gal SL	1 1/4 lb 1 qt	1 1/4 Tbs 2 tsp

Common Name	Class	Brand Names	Formulations	Amounts to Use	
				100 gallons	1 gallon
Common Name	Class	Brand Names	Formulations	Amounts to Use	
				100 gallons	1 gallon
carbofuran	Car	Furadan 4F	4lb/gal F	1-2 fl. oz. Apply as a soil drench to container grown ornamentals.	----
chlorantraniliprole	AD	Acelepryn	1.67 SC	1 fl oz, 2 fl oz, or 16 fl oz for leaf feeding caterpillars. See label for soil treatment application rates for control of lace bugs and birch leafminers	----
chlorpyrifos	OP	Chlorpyrifos 4E AG	4 lb/gal EC	1 qt per acre, 3 qt as a cut stump drench for pales weevil. For use on listed firs, spruce, and tree species	1/3 fl oz, 1 fl oz
		Dursban 50 W	0% WSP	0.5-1 lb, 2 lb 6 lb. 16 lb.	--- --- ---
		Lorsban 4E	4 lb/gal EC	1 qt/acre 3 qt as a cut stump drench for pales weevil For use on listed fir, spruce, and pine tree species.	1/3 fl oz 1 fl oz
clofentezine		Ovation SC	4 lb/gal SC	2 fl oz	----
Clothianidin	CN	Arena 50 WDG	50 % WDG	0.25 oz. per 1,000 sq. ft. (5.4 oz. ai/acre) for soil drenches or broadcast applications. 2 oz. per 100 gals (0.156 lb. ai/acre) for foliar applications.	---- ---
beta-cyfluthrin	P	Tempo SC Ultra	1 lb/gal SC	1.5 fl oz (45 ml)	---
cyfluthrin	P	Tempo 20 WP Decathlon 20WP	20% WP 20% WP	1.3-1.9 oz 1.3-1.9 oz	--- ---
deltamethrin	P	DeltaGard G DeltaGard T&O	0.1% G 4.75% SC	2-3 lb/1,000 sq ft 4-8 oz	---
diazinon	OP	D-264 4EC Diazinon Insecticide	4 lb/gal EC	1-3 pt	1-3 tsp

Common Name	Class	Brand Names	Formulations	Amounts to Use	
				100 gallons	1 gallon
diflubenzuron	IGR	Dimilin	25 W 4 L	2-8 oz/acre 1-4 fl oz/acre	---- ----
dicofol	CH	Kelthane	50% WSP	0.5-1 lb	----
dinotefuran	CN	Safari	20 SG	Foliar spray 0.25-0.5 lb Drench 0.75-1.5 lbs	---- ----
dimethoate	OP	Dimethoate	2.67 lb/gal EC	--	0.75-3 fl oz/6 gal water
dormant oil	misc.	Volck-Saybolt reading of 90-150 sec. (viscosity test 60 cc through standard opening at 100° F.) 90-92% unsulfonatable residues = Superior; 60-85% = Regular	70-90 sec. 80-90 % oil + emulsifier	2-4% oil in finished spray mixture	
endosulfan	CH	Thionex	50% WP 3 lb/gal EC	1 - 2 lb. 2/3 - 1 a qts.	1 - 2 Tbs 1a-2 b tsp/gal
esfenvalerate	P	Asana XL	0.66 lb/gal EC	5.8-9.6 fl oz	0.35-0.58 tsp
etoxazole	IGR	TetraSan 5 WPG	5% WDG	8-16 oz (4-8 packets)	---
fenpropathrin	P	Tame 2.4 EC	2.4 lb/gal EC	5.33-10.66 fl oz 8-16 fl oz for two-spotted spider mite, Southern red mite	
tau-fluvalinate	P	Mavrik Aquaflow	22.3% F	4-10 fl oz	1.33-3 tsp/5 gal
gamma isomer of BHC - lindane	CH	Lindane	20% EC	1 pt	1 tsp
hexythiazox	Thia	Hexygon	50% WP	1-2 oz	--
horticultural oil	misc.	SunSpray Ultra-Fine Oil Saybolt reading of 45-85 sec. 90-98% unsulfonatable residues Superior oils have a high content of paraffinic hydrocarbons with relatively small amounts of aromatic or naphthalenic constituents. These oils are less phytotoxic than the aromatic or naphthalenic oils.	98.8% paraffinic oil	1-2% oil in finished spray mixture Use 4 gallons oil in 100 gallons water for a dormant spray.	2.5-5 Tbs 10 Tbs
imidacloprid	CN	Merit 2	2 lb/gal F	1.5 fl oz for foliar sprays See label drench rate	-- --

Common Name	Class	Brand Names	Formulations	Amounts to Use	
				100 gallons	1 gallon
		Merit 75 WP Marathon 1% Granular Marathon 60WP	75% WP 1% G 60% WSP	3.5 Tbs See label see label	0.25 tsp/2.5 gal See label see label
imidacloprid plus bifenthrin	CN	Allectus SC	5.0% SC 4.0% SC	see label	see label
imidacloprid plus cyfluthrin	CN P	Discus	2.94% L 0.70% L	see label	see label
insecticidal soap	misc.	M-Pede	49% a.i.	1-2% insecticidal soap in finished spray mixture. (i.e. 2 gal soap in 98 gal water)	
		Insecticidal Soap	49.52% CF	see label	--
		Safer Insecticidal Soap	49% a.i.	--	5 Tbs
lambda-cyhalothrin	P	Scimitar Scimitar CS Scimitar GC	10% WP 9.7% CS 9.7% GC	1.2-4.8 oz 1.5-5 fl oz 1.5-5 fl oz	---- ---- ----
malathion	OP	Malathion	57% EC 50% EC	1-4 pt 1-4 pt	2-4 tsp 1-4 tsp
methiocarb	CAR	Mesuroi	75% WP	2 lb/acre in 50 gal water	--
naled	OP	Dibrom 8 Emulsive	8 lb/gal EC	1 pt	1 tsp
parasitic nematode	B	Guardian Nemasys H	<i>Steinernema</i> spp. <i>Heterorhabditis megidis</i>	see label see label	see label see label
permethrin	P	Astro T & O, Pounce, Ambush, Dragnet, Perm-UP	25% WP 3.2 lb/gal EC	0.1-0.2 4-8 oz 1-2 qts (Dragnet for listed bark beetles and borers) 1-2 qts (Perm-UP for clearwing moth borers) 2-5 qts (Perm-UP for bark beetles, bronze birch borer and flatheaded appletree borer)	-- -- -- --
phosmet	OP	Imidan	70% WSB	0.75-1 lb for deciduous shade and ornamental trees. 1.33 lb/acre for Christmas tree plantations. 4% top dip, dripping down to	--

Common Name	Class	Brand Names	Formulations	Amounts to Use	
				100 gallons	1 gallon
				and including root collar only for white, slash and loblolly pine seedlings.	
propargite	misc.	Ornamite	30% WSB	3-7.5 lb/acre/100 gal for Christmas trees and conifers only. 2-5 lb/acre/50-300 gal for field grown roses. 1 lb/100 gal for other ornamentals (field & nursery).	--
pymetrozine	PYAZ	Endeavor	50% WDG	2.5-5 oz with a 7 day retreatment interval for severe insect pressure. 10 oz/acre with a 14 day retreatment interval for normal insect pressure.	--- ---
pyrethrins	BOT	Pyrenone	6% Pyrethrin plus 60% PBO EC	12-24 oz	1-2 tsp
spinosad	spin	Conserve SC	1 lb/gal SC	6 fl oz for chrysomelid leaf feeding beetles, lepidopterous larvae, sawfly larvae and thrips. 11 fl oz for dipterous gall midges 22 fl oz for dipterous leafminers and spider mites. Addition of a nonionic spray adjuvant such as DYNE-AMIC at 0.1% v/v in greenhouse settings and at label rate in outdoor settings has been shown to enhance control of spider mites.	0.06 fl oz (2 ml)
					0.1 fl oz (3 ml)
					0.2 fl oz (6 ml)
		SpinTor 2SC	2 lb/gal SC	2-8 fl oz per acre for Lepidopterous larvae such as fall webworm, gypsy moth and others and sawfly larvae, such as European pine sawfly, pear sawfly and redhead pine sawfly.	---

Common Name	Class	Brand Names	Formulations	Amounts to Use	
				100 gallons	1 gallon
spiromesifen	tet	Judo, Forbid 4F	4 lb/gal F	2-4 fl oz	3-6 ml/5 gallons of spray solution
tebufenozide	IGR	Mimic 2 LV	2 lb/gal LV	4-8 fl oz per acre for browntail moth, elm spanworm, fall cankerworm, fall webworm, forest tent caterpillar, Eastern tent caterpillar, gypsy moth, puss caterpillar, Zimmerman pine moth, spruce budworm and tussock moths. 8 fl oz per acre for pine tip moths such as Nanutcket pine tip moth, European pine shoot moth and several others.	---
		Confirm 2F	2 lb/gal water-based flowable	For Christmas trees only. 4-8 fl oz/acre for gypsy moth, spruce budworm, and tussock moth. 8-16 fl oz/acre for pine tip moths.	---
thiamethoxam	CN	Flagship 25WG	25% WG	2-4 oz for aphids, lace bugs, whiteflies, mealybugs, soft scales, sawflies. 4 oz for leafhoppers, plant bug, honeylocust pod gall, hemlock woolly adelgid, nipple gall and blister gall.	---
		Flagship	0.22 G	40-120 lb/A for aphids, mealybugs and whiteflies.	---
		Meridian	25% WG	2-8.5 oz for aphids, mealybugs and whiteflies. 8.5 oz for adult black vine weevil. 4 oz for blister gall, honeylocust pod gall, leafhoppers, nipple gall, plant bug.	

Common Name	Class	Brand Names	Formulations	Amounts to Use	
				100 gallons	1 gallon
		Meridian	0.33 G	27-80 lb/A for aphids, mealybugs and whiteflies.	
trichlorfon	OP	Dylox 80	80% SP	20-30 oz for Nantucket pine tip moth and zimmerman pine moth. 20-30 oz for bagworms, dipterous leafminers, tarnished plant bugs and other listed pests.	---

AD - Anthranilic diamide

OP - Organophosphate

P - Pyrethroid

IGR - Insect Growth Regulator

B - Biological agent

Misc. - Miscellaneous

PYAZ - Pyridine azomethine

OG - Organotin

tet - tetrionic acid derivative

CH - Chlorinated Hydrocarbon

Bot - Botanical

Car - Carbamate

CN - Chloro-nicotinyl

CBZ - Carbazate

Spin - Spinosyn

Thia - thiazolidinone

Dilution Tables - a Guide to Accurate Measures

Wettable Powders

Number of ounces of wettable powder to use in small sprayers when amount per 100 gallons is known.

100 Gals.	10 Gals.	5 Gals.	2 Gals.	1 Gals.
0.5 lb.	0.8	0.4	0.2	0.1
1 lb.	1.6	0.8	0.3	0.2
2 lbs.	3.2	1.6	0.6	0.3
3 lbs.	4.8	2.4	1.0	0.5
4 lbs.	6.4	3.2	1.3	0.6
5 lbs.	8.0	4.0	1.6	0.8

Emulsifiable Concentrates

Number of fluid ounces of emulsifiable concentrate to use in small sprayers when amount per 100 gallons is known.

100 Gals.	10 Gals.	5 Gals.	2 Gals.	1 Gal.
1 pt.	1.6	0.8	0.3	0.2
1 qt.	3.2	1.6	0.7	0.3

2 qts.	6.4	3.2	1.3	0.6
1 gal.	12.8	6.4	2.6	1.3

Mist Blower

Quantity of emulsifiable concentrate (EC)
needed to make a 25X concentration

If Amount per 100 Gals. for a High Volume Spray is:	Use This Amount in a Mist Blower for:			
	25 Gals	10 Gals	2 Gals.	1 Gal.
1 pt.	6.25 pts.	2.5 pts.	8 fl. ozs.	4 fl. ozs.
1 qt.	6.25 qts.	5.0 pts.	1 pt.	8 fl. ozs.
2 qts.	3.13 gals.	5.0 qts.	1 qt.	1 pt.
1 gal.	6.25 gals.	2.5 gals.	2 qts.	1 qt.

Table of Measures

Liquids

1 level tablespoonful = 3 level teaspoonfuls
1 fluid ounce = 2 tablespoonfuls = 29.57 milliliters
1 cupful = 8 fluid ounces
1 pint = 2 cupfuls = 16 fluid ounces
1 quart = 2 pints = 32 ounces
1 gallon = 4 quarts = 128 fluid ounces

Weights

1 ounce = 28.3 grams
1 lb. = 16 ounces = 454 grams
1 ton = 2,000 pounds

Rates to Use to Treat One Acre

Pounds Actual Pesticide Per Gallon of Liquid Concentrate	Pounds Actual of Pesticide Needed						
	1/4	1/2	3/4	1	2	3	4
	Pints of Liquid Concentrate to User Per Acre						
1	2	4	6	8	16	24	32
1 1/2	1.3	2.6	4	5.3	10.6	16	21. 3
2	1	2	3	4	8	12	16
4	0.5	1	1.5	2	4	6	8

Rates to Use to Treat One Acre

Percent Formulation of Wettable Powder	Pounds Actual of Pesticide Needed						
	1/4	1/2	3/4	1	2	3	4
	Pints of Liquid Concentrate to User Per Acre						
15%	1.75	3.33	5	6.5	13	20	26.5
25%	1	2	3	4	8	12	16
40%	0.6	1.25	1.75	2.5	5	7.5	10
50%	0.5	1	1.5	2	4	6	8
75%	0.4	0.7	1	1.3	2.66	4	5.33

Rates to Use to Treat One Acre

Percent Formulation of Dust or Granules	Pounds Actual of Pesticide Needed						
	1/4	1/2	3/4	1	2	3	4
	Pounds of Dust or Granules to Use Per Acre						
2 1/2%	10	20	30	40	80	120	160
5%	5	10	15	20	40	60	80
10%	2.5	5	7.5	10	20	30	40
20%	1.25	2.5	3.75	5	10	15	20
25%	1	2	3	4	8	12	16

Small Gallonage Rates

If an insecticide recommendation is given on the basis of 100 gallons of finished spray but only 1 gallon is wanted, follow this general rule to prepare that 1 gallon of spray.

Dry Formulations -

For each 1 pound of powder that is recommended per 100 gallons of water, use 1 level tablespoonful (Tbs) per 1 gallon of spray.

Liquid Formulations - For each 1 pint that is recommended per 100 gallons of water, use 1 teaspoonful (tsp) per gallon of spray.

Table 5. Information about Insecticides/Miticides

Rev. 2/11

Pesticide (Common Chemical Name)	Trade Name(s)	Classification	Oral LD 50 (mg/kg)²	Dermal LD 50 (mg/kg)²	Manufacturer
abamectin	Avid	microbial toxins	650	>2000	Syngenta
acephate	Isotox IV, Orthene	organophosphate	980	10,250	Valent, Ortho
actetamiprid	TriStar	chloronicotinyl	1,064	>2000	Cleary
azadiractin (=neem, azatin)	Bioneem, Azatin XL	botanical	4,242	>2000	Safer, OHP
Bacillus thuringiensis var. kurstaki	Biobit, Dipel, Javelin, and possibly others	spores + crystalline delta-endotoxin, microbial	none	none	Valent, Syngenta
bifenazate	Floramite	carbазate	---	---	Chemtura Corp.
bifenthrin	Talstar, Onyx	pyrethroid	375	>2000	FMC
buprofezin	Talus	insect growth regulator (inhibit chitin biosynthesis - type 1)	>5,000 (rat)	>2,000 (rat)	SePro
carbaryl	Carbaryl, Sevin	carbamate	246	>4000	Bayer, Drexel
chlorantraniliprole	Acelepryn	anthranilic diamide	>5,000 (rat)	>5,000 (rat)	DuPont
chloryrifos	Dursban, Lorsban	organophosphate	270	2000	Dow AgroSciences
cryolite	Kryocide	inorganic fluoroine	practically nontoxic		Atochem
cyfluthrin	Decathlon, Tempo	pyrethroid	826	>2000	Dow AgroSciences
deltamethrin	DeltaGard G	pyrethroid	128.5 to >5,000	>2000	Aventis
diazinon	Diazinon, Spectracide	organophosphate	400	3600	Drexel, Syngenta
dicrotophos	INJECT-A-CIDE B	organophosphate	17	224	DuPont, Mauget
diflubenzuron	Dimilin	insect growth regulator	>4640	>10,000	Chemtura Corp.
dimethoate	Dimethoate	organophosphate	235	>400	Platte, Loveland
dinotefuran	Safari	chloronicotinyl	>2000	>2000	Valent
esfenvalerate	Asana XL	pyrethroid	458	>2000	DuPont
etoxazole	TetraSan	insect growth regulator	4,500 (male rat) 2,600 (female rat)	>5,000	Valent
fenetrothion	Pestroy	organophosphate	800	1300	PBI-Gordon
fluvalinate	Mavrik Aquaflow	pyrethroid	282	20,000	Syngenta
hexythiazox	Hexygon	carboxamide	5,000	>5,000	Gowan

Pesticide (Common Chemical Name)	Trade Name(s)	Classification	Oral LD 50 (mg/kg)²	Dermal LD 50 (mg/kg)²	Manufacturer
imidacloprid	Marathon, Merit	chloronicotinyl	2591	>2000	Bayer, OHP
imidacloprid plus cyfluthrin	Discus	chloronicotinyl plus pyrethroid	>5,000	>5,030	OHP
lambda-cyhalothrin	Scimitar	pyrethroid	79	632	Syngenta
malathion	Cythion, Malathion	organophosphate	1000	4100	Setre, Drexel, UAP
metaldehyde	Bug-Geta, Deadline, Slug-Geta	metacetaldehyde	360	---	Valent
methiocarb	Mesuroi	carbamate	20	>5000	Gowan
naled	Dibrom	organophosphate	272	1100	Valent
oxydemeton-methyl	Harpoon, MSR Spray Concentrate	organophosphate	48	112	Gowan
permethrin	Ambush, Pounce, Astro, Perm-Up	pyrethroid	4000	>4000	FMC, Syngenta, United Phosphorus
petroleum oils	Dormant, Summer, Superior Oils, etc.	hydrocarbon oils	exempt		numerous
phosmet	Imidan	organophosphate	147	>4640	Gowan, Florida Silvics, Inc.
propargite	Ornamite	sulfite ester	4029	2940	Chemtura Corp.
pyrethrum	Pyrethrin, Pyrellin, Pyrenone, etc.	botanical	1500	1800	Fairfield, Prentiss, etc.
rotenone, cube ¹	Prentox, Rotenone	botanical	1500	---	Fairfield, Prentiss
spinosad	Conserve SC, SpinTor 2 SC	spinosyn	>5000	---	Dow Agro Sciences
soaps, pesticidal	Aphid-Mite Attack, Insecticidal Soap, M- Pede, etc.	Fatty acid salts	practically nontoxic		Mycogen, Ringer
tebufenozide	Confirm 2F, Mimic 2LV	insect growth regulator (benzoic acid hydrazide)	>2150	---	Dow AgroSciences
thiamethoxam	Flagship	neonicotinoid	>5000	>2000	Syngenta
trichlorfon	Dylox	organophosphate	250	>2100	Bayer
spiromesifen	Judo, Forbid	Tetronic acid derrivatives	>2000	>2000	Bayer, OHP

¹Farm Chemicals Handbook '93 (Meister Publishing Co., Willoughby, OH), and technical data information where available.

²Equals milligrams per kilogram of body weight applied orally or dermally. (1 milligram = 1/1,000 of a gram, 454 grams = 1 lb.)

PRODUCTS LISTED IN TABLES AND TYPE OF REGISTRATION ^{1a}

Acelepryn	Guthion 2S (H)	Shuttle 15 SC
Allectus SC	Harpoon (H)	Slug-Geta
Arena 0.25 G	Hexygon 50-WP (*)	Soaps
Asana XL (H)	Imidan 70-WSB (*)	Spectracide 25% EC
Avid (*)	Inject-A-Cide (H)	SpinTor 2SC
Bioneem	Inject-A-Cide B (H)	<i>Steinernema</i> spp.-
"Bt" (kurstaki)	Isotox IV	entomopathogenic
Bug-Geta	Judo 4F	nematodes
Carbaryl 5D	Kelthane 50 WSP (*)	Talstar T&O (*)
Carbaryl 10D	Kryocide 96% WP	Talstar 10WP (*)
Carbaryl 4L	Lorsban 4E	Talus 40SC
Carbaryl 50WP (*)	Malathion 50	Tempo 2
Celero 16 WSG	Malathion 57	Tempo 20WP
Chlorpyrifos Pro 4 (@)	Marathon 1% Granular	TetraSan 5WDG
Chlorpyrifos Pro 2 (@)	Marathon 60 WP	Thiodan 50WP (*)
Confirm 2F	Mavrik Aquaflo	Thiodan 3EC (*)
Conserve 1 SC	Meridian 25 WG	TriStar 30 SG
Cythion 5EC	Merit 75WP	
Cythion 8EC	Merit 2	
Deadline Bullets	Merit 0.5G	
Deadline Granules	Mesuro 75% WP	
Decathlon 20% WP (*)	Mimic 2LV	
DeltaGard G (&)	MSR Spray Concentrate (H)	
Dendrex	Oils	
Diazinon 50W (*)	Onyx (&)	
Diazinon 2E	Onyx Pro (H)	
Diazinon 4E & AG500 (*)	Ornamite	
Discus (*)	Orthene 75% SP	
Dicofol 4EC	Orthene 9.4%EC	
Dibrom 8 Emulsive	Ovation SC	
Dimethoate 400	Pestroy 4EC	
Dimilin 4L (H)	Pounce 3.2EC (H)	
Dimilin 25W (H)	Pounce 25WP (H)	
Dursban Pro (H)	Pyrethrin (+PBO)	
Dursban 50W (H)	Resmethrin EC26	
Dursban TNP (@)	Rotenone + Pyrethrin	
Dylox (*)	Rockland Shade Tree	
Flagship 25WG	Insect Spray	
Floramite	Scimitar WP (*)	
Forbid 4F	Sevin Liquid 2F	
Furadan 4F (H)	Sevin 50W	
	Sevin 5 Dust	

^{1a} Products without symbols are general use products.

Products with (*) are designated on labels as "Commercial or Agricultural Use Only"

Products with (H) are designated on labels as "Restricted Use Pesticide"

Products with (#) are designated on labels as for use by individuals/firms licensed or registered by state to apply termiticide products.

Products with (@) are to be applied only by or under the direct supervision of trained applicators responsible for insect control programs.

Products with (&) are for sale to, use and storage by commercial applicators only.

Products with (%) are intended for use by commercial applicators only.

Precautionary Statement

In order to protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store, or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label. Persons who do not obey the law will be subject to penalties.

Disclaimer Statement

Pesticides recommended in this publication were registered for the prescribed uses when printed. Pesticides registrations are continuously reviewed. Should registration of a recommended pesticide be canceled, it would no longer be recommended by the University of Tennessee. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others which may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product.

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